ARCHIVES

OF

85332

OPHTHALMOLOGY

EDITED IN ENGLISH AND GERMAN

BY

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OF NEW YORK

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NOVEMBER

NEW YORK
G. P. PUTNAM'S SONS, 27 & 29 WEST 23D STREET
AND NEW ROCHELLE, N. Y.
LONDON: 24 BEDFORD STREET, STRAND
WIESBADEN: I. F. BERGMANN'S Verlag
PARIS: J. B. BAILLIÈRE, 19 Rue Hautefeuille
1898

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edies, and instruments, and to discuss in a progressive, yet conservative spirit all questions of present importance.

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G. P. PUTNAM'S SONS, Publishers

NEW YORK
27 & 29 WEST 23D STREET.

LONDON
24 BEDFORD ST., STRAND.

PUBLISHER OF THE GERMAN EDITION
I. F. BERGMANN
20 Schwalbacher Strasse, Wiesbaden.

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In asking for continued support of the ARCHIVES from subscribers and contributors, the Editors offer no new program, but point to the record of the work that has been accomplished during the past twenty-eight years. At the first appearance of the ARCHIVES in 1869, they constituted the only periodical of their class in America, and had only a few predecessors in Europe. The international character of the ARCHIVES was a novel and distinctive feature.

The original program of the ARCHIVES to publish only original papers in semi-annual independent numbers has, in the course of years, been extended by the addition of reviews of the current ophthalmological and otological literature.

With the eighth volume, in 1879, the combined ARCHIVES, issued semi-annually, were divided into two separate journals, issued quarterly, and each of about the same size as the combined journal, and the reviews were converted into quarterly reports, systematic and comprehensive, though concise, on the progress of ophthalmology and otology.

Since that date, the ARCHIVES have developed into an extensive and conveniently arranged storehouse of knowledge for the instruction of the student and for reference by the practitioner and the investigator.

For more than ten years, the valuable material offered to the ARCHIVES has been so abundant that it has not been practicable to utilize for the English edition the full series of papers from the German, or the converse. Many articles had to be abridged, while of others abstracts only could be printed. Any one of our readers could, however, have secured, and can secure in future, from the American editor, or the German publisher, the loan of the original papers presenting the complete text.

It is the purpose of the editors to arrange, in the department of Reports, for the review of every publication which in their opinion contains material that can be called distinctive and important. It is, of course, impossible, within the limits of the ARCHIVES or of any similar journal, to give attention to every publication in their department of science. We may state further that it is not a part of our program to furnish a complete report on the *bibliography*, but only on the **progress** of ophthalmology and otology.

Though the systematic arrangement of the reviews is of importance for reference and comprehensive information, we shall publish, as early after the meetings as practicable, reports of the proceedings of societies, always bearing in mind that the ARCHIVES are not intended to be only a repertory of knowledge, but also a journal of news.

It is natural that the English edition of the ARCHIVES should give the advantage of time and space to Anglo-American contributors over the German, and *vice versa*. It is evident, however, that the association of the two editions lends strength to each, furnishing to the authors a wider circulation for their papers, and to the readers a larger and more diversified field of information.

ARCHIVES OF OPHTHALMOLOGY

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The ARCHIVES OF OPHTHALMOLOGY contain *original papers* on all branches of ophthalmic surgery, and *original reports* on the progress of ophthalmology. The original papers occupy from two thirds to three fourths of the space, and their scope embraces all subjects of scientific and practical interest connected with this department of medicine.

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Particular attention is paid to the preparation of the Report on the Progress of Ophthalmology. The report is intended to furnish a *complete, systematic, and early* review of the current ophthalmological literature of the world. It has been necessary to divide the work of its preparation among a number of collaborators according to the following arrangement:

Dr. ST. BERNHEIMER, of Vienna.

1. *General Ophthalmological Literature:*
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7. *Injuries and Foreign Bodies of these parts.*

Dr. P. SILEX, Lecturer at the University of Berlin.

1. *Uveal Tract*, including glaucoma.
2. *Refracting Media*, including the lens.
3. *Retina and Optic Nerve.*
4. *Injuries and Foreign Bodies of these parts.*
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In order to obtain complete and recent reviews on the non-German ophthalmological literature, special reporters have been selected for different countries, who will send monthly abstracts of all local ophthalmological publications to Dr. C. Horstmann, of Berlin, the editor of the Report. Dr. Horstmann will distribute these abstracts among the German reporters according to the above plan, in order to preserve the systematic arrangement. which we think of paramount importance.

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In the interest of our readers, who are scattered over the whole world—and whom, like ourselves, we desire to keep informed of all advances in ophthalmology,—furthermore in their own interest, authors of ophthalmological works are requested to send reprints, duplicates of journals, or copies for reviewing, to one of the above-named reporters, or to the editors or publishers of the Archives, according to their convenience.

The abstracts of American ophthalmological literature formerly appeared under a special head, but are now embodied in the systematic Report. Text-books may be specially noticed.

The number of good papers offered us for publication has increased to such an extent that it is no longer possible to translate all of them unabridged. Whenever a German paper is condensed in the English version, or *vice versa*, it will be so stated. Should any one of our readers wish to recur to the original, the editors will always take pleasure in sending it for reference.

Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the ARCHIVES, and are solicited.

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The editors and publishers of the ARCHIVES beg to offer some suggestions to authors who propose to favor them with their contributions.

1. As original communications the ARCHIVES can accept only such papers as have never been printed nor are intended to be printed in other journals. If a preliminary communication on the subject of a paper has been published, the author is requested to state this in the letter accompanying his manuscript. It is understood that contributors to these ARCHIVES and editors of other periodicals will make no abstracts of the original papers published in this journal without giving it due credit for the same.

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c. Draw a line along the margin of such paragraphs as should be printed in smaller type—for instance, all that is clinical history in reports of cases, etc.

d. Words to be printed in *italics*, should be underscored once, in SMALL CAPITALS twice, in LARGE CAPITALS three times.

4. Authors may receive proofs for revision if they will kindly return them without delay. We beg however to remind our contributors that changes in the copy are equivalent to resetting, causing so much additional expense. We therefore request them, to make, if possible, no alterations at all in their MSS., or, at least, to limit these to what is of essential importance.

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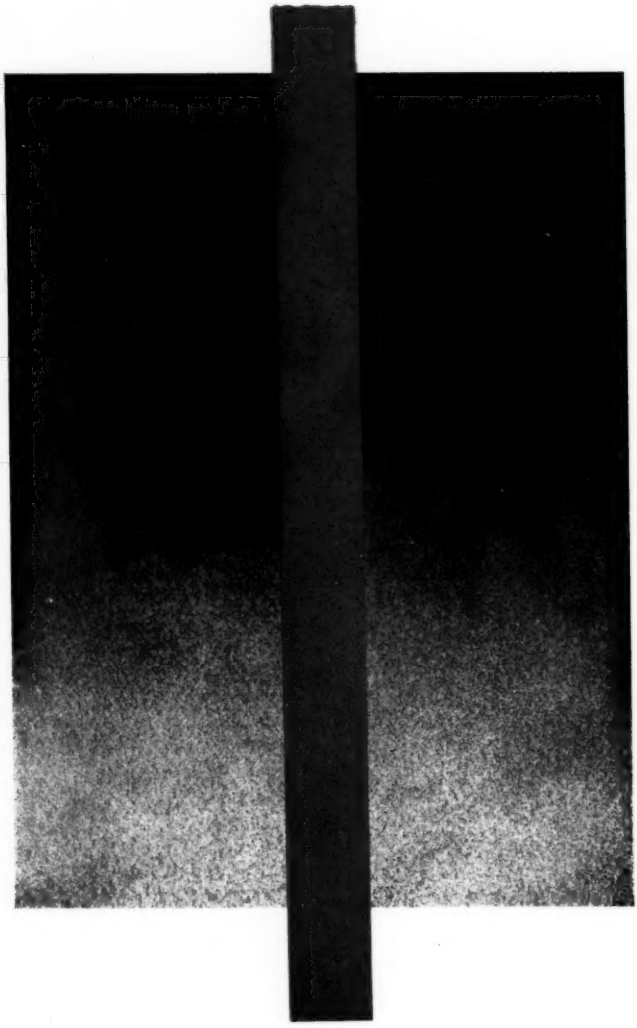

Illustrating Dr. Holden's Paper.

ARCHIVES OF OPHTHALMOLOGY.

THE FLUTTERING PRODUCED BY THE JUXTAPOSITION OF CERTAIN COLORS, AND OF BLACK AND WHITE.

By Dr. WARD A. HOLDEN.

(*With text-plate I. and two figures in the text.*)

I.—THE FLUTTERING OF COLORS.

THE appearance of fluttering which is produced on looking at certain colors when juxtaposed was described by Wheatstone in 1844, and has long been known as the phenomenon of the fluttering hearts. Meyerhausen has called it "chromato-kinopsia," and Schapringer "metamorphopsia from color difference." Helmholtz[1] described it in the following words: "On colored sheets of stiff paper are laid figures of some other lively color. Red and blue seem to act best, but the colors must be very lively and saturated. When the sheets are looked at, and are moved back and forth with a certain rapidity, the figures seem to undergo a displacement as respects the paper and to flutter here and there over the surface." Donders observed that strips of blue on a dark ground seemed to stand out in relief, but that strips of red or yellow seemed to stand out in still greater relief. Einthoven,[2] at Donders's suggestion, undertook some experiments and wrote a paper called "stereoscopy by means of color difference," the point of his argument being that when the eye is focussed for one color such as red, another color such as blue will form a diffusion circle on the retina, on account of the chromatic aberration due to the imperfect centering of the eye, and this leads to the different degrees of relief in which different colors seem to stand out.

Brewster found that red and green acted best in his experiments, and he attributed fluttering to the persistence of the after-images of these two complementary colors. Helmholtz explained the phenomenon by supposing ocular impressions to arise and pass away with unequal rapidity in the case of different colors. A paper by Meyerhausen [3] contains abstracts of all the earlier theories, including those of Wheatstone, Brewster, Brücke, Taylor, Dove, Oppel, and Helmholtz, some of whom believed fluttering to be due to the chromatic aberration of the eye, and some to subjective spectra. Meyerhausen believed that the apparent shifting about of the colors was due to the persistence of positive after-images. Szili,[4] on the contrary, believed it to be due to the persistence of negative after-images, and he found the phenomenon most evident when the figures had the same luminosity as the ground. Schapringer,[5] in the latest paper on the subject, goes back to the diffusion-circle theory of Einthoven, and considers "stereoscopy from color difference," or the apparent different relief of different colors, as identical with the phenomenon of fluttering; and he attempts to assist the explanation of the fluttering by considering not only the different degrees of apparent relief in which different colors are seen on the same ground, but also their apparently non-uniform motion when the sheets are moved quickly back and forth. From what follows, however, it will appear that all three of these phenomena are distinct, and each requires a different explanation.

After having taken up this subject independently and making a considerable number of experiments, I found, when I came later to read the literature of the subject, that my results agreed more nearly with the views of Szili than with those of the other authors. The phenomenon of fluttering, as I understand it, is caused by the brief persistence of negative after-images seen most clearly when the two colors are of nearly equal luminosity; provided that one of the colors is intense, and that the two are not of hues which lie near each other in the spectrum. In this paper it is proposed to explain in more detail than has been done the nature and causes of the phenomenon, discussing particu-

larly the way in which relations of luminosity between object and background are concerned in bringing about the appearance of fluttering, the appearance of relief, the appearance of motion, and the visibility of after-images; and concluding with an explanation of the fluttering occasioned by black and white, and its effect on the legibility of the printed page. Many of these effects, so far as I know, have not been treated of before or, if at all, but briefly.

As it is difficult to procure or prepare colors of desired luminosities, and as, furthermore, the luminosity of the different colors changes in different measure with changes in general illumination, these experiments were much facilitated by using a new device, namely, a background of graduated luminosity, on which the test-objects could be shifted so as to give any desired relation of luminosity between test-object and background. To prepare these backgrounds, sheets of paper were painted at the top with a thick wash of water color of saturated hue, which was gradually diluted as it was applied lower down, there thus being produced a colored surface ranging from the palest tint to saturation. Neutral gray grounds also were used, ranging from a gray that was very light at one end of the sheet to a gray that was very dark at the other.

Luminosity.

Luminosity, or light-intensity, or brightness in a color not self-luminous, is its worth as expressed in terms of a standard black and white. The painter's name for this is "value," and he obtains the relative values of the various colored objects before him by pinching his lids together so that only a few rays pass into his eye; color is by this means, to a considerable extent, eliminated, and slight differences in value are then clearly recognized, because one object appears merely lighter or darker than another. The same result is obtained by carrying a small, colored test-object laid on a ground of another color out into the periphery of the field of vision where the color of the test-object is not recognized, and it appears merely lighter or darker than the ground. The precise photometric determination of a color may be

done by Rood's[8] flicker method, in which one color is compared with another, or with gray, by placing a semicircle of each on a disc which is rotated with a certain rapidity. If now the two semicircles are of equal luminosity, the disc appears to be of a constant hue and of a constant luminosity, but if they differ in luminosity by even a small amount, any point on the disc appears to be of a constant hue, but to be alternately lighter and darker, this rapid alternation in luminosity causing the sensation of flickering. For ordinary experiments, the first method of comparing luminosities by pinching the eyelids together is sufficiently accurate.

Effects of viewing a Colored Object on Backgrounds of the same or of different Luminosity.

If a strip of saturated orange color is placed vertical on a graduated gray sheet which is lighter at the bottom, the upper portion of the orange strip will appear lighter than it really is, by reason of contrast with the much darker gray ground. Similarly, the lower portion of the orange strip will appear darker than it really is, from contrast with the lighter gray ground. At some point near the middle of the sheet, however, where both strip and ground have the same luminosity, the strip will appear to be of its natural tone. Text-plate I. (Best seen with diminished illumination.)

The upper portion of the strip, being light on a dark ground, will appear also to stand out in relief, and the lower portion of the strip, being dark on a light ground, will seem to be sunken behind the plane of the sheet. The middle portion of the strip, however, will at first glance appear to lie exactly in the plane of the ground which is here of the same luminosity as the strip. But as one looks back and forth from strip to ground, the strip appears, as respects the ground, alternately to advance and recede, and it appears also to shift and flutter from side to side; the eyes change their focus and convergence in the effort to hold the strip still, and the observer becomes puzzled and confused, with a feeling that the eyes themselves, are at fault. This is the phenomenon of fluttering.

Finally, if the sheet is moved back and forth laterally with

a certain rapidity, the upper and lower portions of the strip will preserve their sharp outlines and their natural width, but the central portion will lose its definite outlines and broaden out perceptibly.

With a red strip these peculiar appearances are manifest when the gray ground is of the same luminosity or slightly lighter. With a blue strip the ground must be of the same luminosity or slightly darker. Szili first pointed this out with reference to fluttering. These effects are all obtainable with monocular vision but are heightened when both eyes are used.

Luminosity and the Perception of Relief.

When a blue strip is laid on a black ground and viewed from a distance, it appears in a certain definite relief—in fact, one can almost express in inches its apparent elevation above the background. Red, as Donders found, appears in greater relief, and yellow in still greater. Indeed, every spectral color on black will appear in a particular degree of relief; but it is easy to show that the amount of apparent elevation is independent of hue and depends entirely upon luminosity. Spectral red is more luminous than spectral blue and appears in higher relief. But when a *light* blue and a *dark* red are used, the blue appears more elevated than the red, since the relative luminosities are then reversed. It is not necessary to assume, as some have done, that those persons who state that blue appears in higher relief than red, have abnormal perceptions. They have, no doubt, experimented with a blue that was more luminous than their red. Indeed, a gray strip of the same luminosity as a strip of any color whatever, will, when laid near the colored strip on the same black ground, appear elevated in the same degree. And a gray or colored graduated strip laid on black will appear to rise at an angle, with its lighter end more elevated. It is thus evident that hue has no effect upon apparent relief, this depending solely upon relations of luminosity. Apparent relief is greatest when the difference in luminosity is greatest; fluttering, on the other hand, is most evident when the difference in luminosity is least. The two phenomena are therefore

not the same in kind, and an explanation of one cannot assist the explanation of the other.

Luminosity has a marked bearing upon the appreciation of actual as well as of apparent relief. If one looks through a tube which cuts off the view of outside objects, at a strip some distance in front of a ground that is lighter or darker than the strip, a fair judgment of the distance between strip and ground can be arrived at, particularly when the strip is vertical so that the two eyes obtain a stereoscopic impression. But with a colored strip in front of a background that is of the same luminosity, whatever the color may be, the amount of actual relief, or even the fact that the strip actually is in relief, is extremely difficult to determine; and the strip flutters and alternately advances and recedes exactly as it would appear to do if it lay directly upon a ground of the same luminosity.

Luminosity and the Perception of Form.

Luminosity has to do with the perception of form also. Color is recognized farthest in the distance and farthest in the periphery of the field (or at least equally far as under any other conditions) when the colored object lies on a ground of the same luminosity. But form is perceived with the greatest difficulty when object and ground are of equal luminosity. For example, test-letters of saturated red, half an inch high, will, on a white ground, be recognized by the normal eye at twenty feet, as will black letters of equal size. The same red letters on a light gray ground will be recognized at ten feet only; and if placed on a gray ground of the same luminosity they will not be recognized at a greater distance than four or five feet.

Luminosity and the Perception of Apparent Motion.

As we saw above, when a colored strip on a ground of the same luminosity is moved quickly from side to side, its outlines become uncertain and it appears to broaden out. Now any object moving with sufficient rapidity will appear elongated in the direction of its motion: a shooting star seems a curved line, a spot on a revolving disc seems a circle. This

elongation is commonly described as being due to the duration of the impression after the excitation has ceased. While it can be obtained with any background whatsoever, provided the motion is rapid enough, it can be got with the least rapid movement when the background is of the same luminosity as the object. Various experiments based upon this fact have been made and they have not always been interpreted rightly.

Szili placed alternate strips of red and blue a little way apart on a black ground, and found that when the sheet was moved quickly from side to side the blue strips seemed to shift back and forth between the red strips. Schapringer placed different colored strips on grounds of various colors and from the differences in apparent motion he drew conclusions as to the effect of color.

The apparent movement of the strips is due to the broadening. Movement to the right broadens the strip to its left side through the persistence of its positive after-images projected on the spots from which the strip has just moved. Thus the strip will seem to move toward a strip of other luminosity, lying to the left, whose margins remain sharply outlined, and which therefore seems to remain fixed on the ground. Now with two sets of strips of different color on a ground of any color, a rapid movement will make that set which more nearly agrees with the ground in luminosity appear to shift back and forth between the set of strips of the other color. Thus in Szili's experiment just cited, the blue strips being darker than the red and thus being more nearly of the same luminosity as the black ground, appear to shift as compared with the red strips. The rapidity of movement required is least when one set of strips has the same luminosity as the ground. The phenomenon arises under the same conditions as fluttering. Its production differs from that of fluttering in that it is due to a series of over-lapping positive after-images seen with rapid movement, while fluttering is due to negative after-images seen with slower movement. It depends upon luminosity and not hue, and it may be obtained with grays and black and white as well as with colors. In fact, if alternate strips of blue and yellow

are laid vertical on a graduated gray ground, rapid movement back and forth will make the yellow strips seem to shift between the blue at the lighter end of the sheet, and the blue strips seem to shift between the yellow at the darker end of the sheet.

Fluttering.

The phenomenon of fluttering really consists of two elements: first, what may be called a *flashing*, caused by the short persistence of an after-image after brief fixation, and, second, what may be called a *glowing*, caused by the longer persistence of an after-image after longer fixation.

The flashing may be explained as follows. Let, for example, an orange strip, O O, be laid across a graduated gray sheet at the place where the two are of equal luminosity. If one looks at a point, x (Fig. 1), for two or three seconds and then directs the gaze to point y, there will be seen a

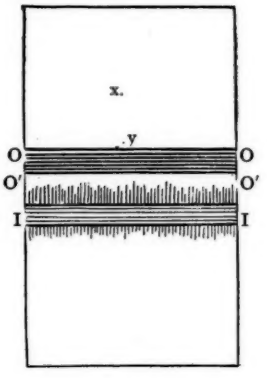

FIG. 1.

negative bluish-green after-image of O O at I I; and, in accordance with the law of simultaneous contrast, the ground bordering I I above and below will appear faintly orange.* The faint orange-colored field O′ O′ will be more intense

* Or with Text-plate I, let some point be looked at to one side of the colored strip, near its centre.

near the margin of I I, and as it persists for a second and then suddenly fades away, it seems to jump back to the orange strip O O. The sudden appearance and immediate disappearance of this faint orange field O′ O′ give rise to the appearance of flashing.

The negative bluish-green after-image I I persists a little longer, and slowly fades away unnoticed. But if the fixation has been very brief, or if the ground is colored instead of gray, this after-image alone will be noticed, and its sudden appearance and immediate disappearance will give rise to the same effect of flashing. If now the gaze is directed slowly up or down the sheet, with each jerky movement that the eyeball makes, a flash will seem to spring from the orange strip in the direction of the motion of the eye and at once spring back again.

When the orange strip is laid on a lighter gray ground, the induced field O′ O′ is faint and almost colorless; and when the orange strip is laid on a darker gray ground, neither the negative after-image nor the induced color appears. With a blue strip the flashing is fainter on a ground darker than the blue, and is not visible at all on a much lighter ground.

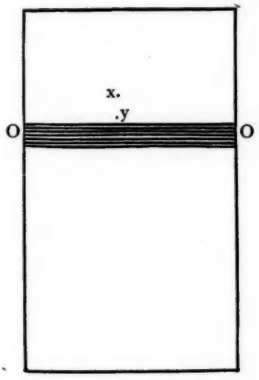

FIG. 2.

The *glowing* may be explained as follows. Let, as before, an orange strip be laid on a gray ground of the same

luminosity. Then if one looks at a point x (Fig. 2) for ten seconds or more, and afterward directs the gaze to y, the upper half of the strip O O will appear to be a more saturated and intense orange, while the lower half of O O will retain its usual appearance. A negative after-image of a narrow strip of gray ground, just above O O, is now projected upon the upper half of O O, rendering the latter more brilliant, so that it seems to glow for a few seconds and then to fade back to its previous state. If the gaze is directed back and forth from strip to ground, the colors near their junction become glowing alternately, thus leading to such uncertainty of outline that the margin seems to shift back and forth. The introduction of a line of black or white along the edges of the strip fixes the outline and diminishes the apparent shifting. And when the difference in luminosity between strip and ground is so great that fluttering does not occur, it often may be brought about by introducing along the edges of the strip marginal lines of a luminosity between those of strip and ground.

Thus the appearance of flashing and glowing is due to transitory, localized alterations of luminosity, saturation, and hue, both in the strip and background. The position of these alterations shifts with every movement of the eye, and they are apparent as well with excentric vision as with direct.

To understand these phenomena fully, it is necessary to study some points in regard to the luminosity of after-images, and some in regard to the resultant color produced by combining the subjective, colored after-image with the objective, colored ground upon which the after-image is projected.

The Luminosity of After-Images.

A light spot on a dark ground gives rise to a *dark* negative after-image, which renders darker any ground upon which it is projected, even if the ground is black. Similarly, a dark spot on a light ground gives rise to a *light* negative after-image, which renders lighter any background upon which it is projected, even if the ground is white. If an indicated small portion of a gray ground is looked at at-

tentively, no after-image of the portion appears when the gaze is directed toward another portion of the uniform ground. But let the portion observed be surrounded with white paper, and a dark after-image of the portion will appear when the direction of the gaze is altered, and if the white paper is removed will appear even while the direction of the gaze remains unchanged. Similarly, surrounding the portion with black paper causes a light after-image of the portion to appear when the black paper is removed.

When, however, a spot is viewed on a ground of the same luminosity, but of different color, the negative after-image of the spot will have the same luminosity as any background upon which it is projected, and will differ from the ground in hue only.

It is easy to see by trial that a shorter period of fixation suffices to produce an after-image when the object viewed and the ground it lies upon are of the same luminosity; and, furthermore, that a faint after-image is recognized most readily when projected upon a ground of the same luminosity with itself. These two facts explain why fluttering is most marked when the two colors observed are of like luminosity. An after-image will be formed, it is true, whatever the luminosity of the ground on which the object lies, or whatever the luminosity of the ground upon which the after-image is projected; but if the relations of luminosity are not favorable, a longer time of fixation is required, and, in consequence, the after-image is more intense and lasting; it fades away but slowly, therefore causing neither flashing nor glowing, since these are brought about by the successive appearance of after-images of brief duration.

The Color Combinations of After-Images.

Whatever the actual physiological process in the fatigued retina may be, the color of an after-image combines with the color of the ground upon which it is projected as if both were actual colors. Thus, if a red object is viewed for some seconds, a complementary green after-image appears, which when projected on a green ground intensifies the color of the ground and makes it glow; projected on yellow it forms

a yellowish-green more intense than the ground color; projected on blue it forms a bluish-green more intense than the ground color; but projected on red it neutralizes that color, producing a spot more or less colorless. When a blue object is viewed, a yellow after-image appears which intensifies yellow, red, and green, but neutralizes blue. It is thus evident that to intensify the color of the ground the after-image must be of a hue which lies in the spectrum near the hue of the ground. Hence fluttering is most marked when colors are juxtaposed which lie some distance apart in the spectrum, the complementary-colored after-image of one color being near the hue of the other. Gray acts well with any color, its after-image always intensifying the color of the ground upon which it is projected. The reason of this is as follows: When a neutral gray spot is viewed, for example, on a ground of red, the after-image of the red ground will be green, and by contrast the after-image of the neutral gray spot appears red. This red after-image has exactly the hue of the ground, and when projected upon it intensifies it greatly.

When a small red object on a gray ground is viewed excentrically for five seconds with accurate fixation, the red fades away, to reappear when the eyes are moved so that the image of the red object falls on a portion of the retina which is unfatigued for red. If fixation is continued after the color has faded away, and the red object is removed, a green after-image appears on the gray ground at the spot where the object lay. The fading away would seem to imply the gradual development of a complementary-colored after-image which neutralizes the color looked at.

II.—THE FLUTTERING OF BLACK FIGURES ON A WHITE GROUND.

If we go now to the other extreme, and make the difference in luminosity between object and ground as great as possible by employing glaring white and glossy black, the same appearance of fluttering will be observed as in the case of colors when the difference in luminosity was least. When a black strip on a glazed, well-illuminated, white ground is

gazed at for a second and the direction of the gaze then altered, a white after-image of the black strip is seen projected on the white ground, and this image, fading away immediately after its appearance, gives rise to the appearance of flashing. When the black strip is gazed at for several seconds and the direction of the gaze altered very slightly, a bright, white, persistent after-image is seen bordering one margin of the strip and giving rise to the appearance of glowing. When a horizontal black line is looked at intently, the eye after a few seconds begins to waver, and a glowing after-image then appears alternately above and below the line, causing the line itself to appear to flutter up and down. If there are other black lines above and below, they all seem to flutter, to undulate, and to grow alternately lighter and darker, while the white intervals between the lines seem to advance and recede in varying relief. This suggests the inquiry: How does the presence of these after-images affect the legibility of the printed page?

Reading a single line of print will not produce a perceptible after-image of the line, but when a number of successive lines are read the fatiguing effect on the retina is cumulative and produces white after-images of the lines. If ten lines of a page are read and the gaze is then directed to the blank margin of the page, one will see a number of white after-images each as broad as a line of print, and these will persist for five or ten seconds. The confusion in reading due to these after-images is more marked when the paper is a glazed and glaring blue-white than when it is cream-tinted, and more marked also when the general illumination is very strong; and it varies with the cut of the type, the spacing of the words, and the leading of the lines.

It is the down-strokes that characterize a letter of the alphabet, the cross-strokes being of less importance; and hence in most fonts of type the down-strokes are bold, while the cross-strokes are merely hair-lines. If now a line of such print is read, and particularly if the words are spaced well apart, the cross-strokes at the top and bottom of the small letters fail to form nearly continuous horizontal lines which could serve as guides to the eye, fixing it on the row of let-

ters, and letting it glance along, as it should, just below the upper cross-strokes of the short letters. The result of reading such print is that, after a few seconds, white after-images appear bordering the tops and bottoms of various letters and words, the line of print does not hold together, the eye wanders up and down, and, with this, individual letters and words shift up and down, so that the line appears undulatory, words here and there in the lines above and below obtrude themselves upon the notice, the attention is distracted, and reading becomes fatiguing. Such lines hold together better when a similar type of smaller size is used, or when the page is held two feet from the eye instead of one, or when the down-strokes of the letters are made bolder.

Again, if the cross-strokes of a type are heavy and the words not much spaced, the line of print appears firm and definitely a line, since the cross-strokes of the small letters form nearly continuous lines which keep the gaze from wandering. But in this case the line of print as a whole soon becomes bordered, first above and then below, with a white, glowing after-image, and the line of print as a whole then appears to shift up and down. If now the lines are not sufficiently leaded, and lie close together, this vertical shifting confounds the line being read with that above or below, and reading becomes as fatiguing as in the other case. This fluttering may involve not only the line being read but a number of other lines on the page.

It would be out of place here to digress further into the interesting subject of the elements which make for legibility in the printed page, a subject treated of in detail by Javal' twenty years ago, and somewhat added to by Hermann Cohn and others who have written on it since. The matter of after-images, the conditions under which they arise, and their effects, it may be said, however, seem never to have been taken into account, yet after-images are certainly the ultimate cause of much of the discomfort experienced in reading. After a type of sufficient size and clearness has been chosen, it remains for the printer to reduce to a minimum the disturbing effects of the after-images. This means long experimentation with the color and lustre of the ink, the

spacing and the leading of the type, and the color and finish of the paper. The greatest offenders in this matter are the books printed on highly glazed paper, notably some of the high-class illustrated magazines, with their much vaunted press-work, and most of the *éditions de luxe* of illustrated books; the print of these is at first glance often very pleasing, but it fails to stand the test of continued reading.

RÉSUMÉ.

When two colors of nearly equal luminosity are juxtaposed, one color will seem to dart over the other color, and the margin between them will appear constantly to shift as the eyes or the colors are moved. This fluttering is due to the negative after-images of each color being projected upon the other color; and it is seen best when the two colors are nearly equal in luminosity, because an after-image of an object arises most readily when surrounding objects are of the same luminosity, and also because after-images are perceived most readily when projected on a ground of the same luminosity. An after-image of short duration gives rise to an appearance of flashing. An after-image of longer duration projected on a background of nearly the same color intensifies that color and gives rise to an appearance of glowing. The after-images appearing and fading away, and shifting with every movement, give rise to the appearance of fluttering.

Different colors on a dark ground appear to stand out in different degrees of relief, and this has been confounded by some authors with the phenomenon of fluttering. But apparent relief is entirely independent of hue and depends solely upon relations of luminosity; it being greater the greater the difference in luminosity between object and background, while fluttering is most apparent when the difference in luminosity is least.

Black on a pure white ground readily gives rise to white after-images which cause either flashing or glowing according to their duration, and black objects on white thus appear to flutter as do juxtaposed colors of equal luminosity. Such after-images arising from the cumulative fatigue of the retina in reading successive lines of print give rise to much of the

discomfort experienced in reading badly printed pages, and the printer's aim should be to compose a page in which the disturbing effects of these after-images are reduced to a minimum.

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AN UNUSUAL CASE OF TRAUMATIC PARALYSIS OF THE RIGHT ABDUCENS.

By Dr. HARRY L. MYERS, Norfolk, Va.

AFTER a review of the admirable articles of Drs. O. Purtscher and Harry Friedenwald on "Traumatic Paralysis of the Abducens" published in these ARCHIVES, vol. xxiii., No. 4, together with a critical review of the other literature of the subject, I find no case the exact parallel of the one appended. Believing that it will be of interest to the profession I offer it for publication.

H. M., male, aged eleven years, while running in play, swerved suddenly to the side to avoid a collision with one child and in so doing brought his right temple in violent contact with the forehead of another. The violence of the collision was sufficiently great to cause both children to cry with pain, but neither one was knocked off his feet, nor was the skin broken at the point of contact on either child.

One child recovered quickly from the accident; the other, however, noticed immediately that he "saw everything double," and was only able to see single when he turned his face to his extreme right. According to his statement and that of his father, who was present, there was not displayed a single symptom of any other kind. The patient states that, except a slight soreness over the temple, he suffered no pain after the accident, though close questioning disclosed the fact of a slight frontal headache the next day, only lasting an hour or so. There was no dizziness, loss of consciousness, nausea, disturbance of hearing, or drowsiness. In short the diplopia and the position of the eye were the only contrasts to his normal condition.

The patient states, and I believe correctly, that one hour after

the accident the diplopia completely disappeared and that his vision and the proper position of his face became perfectly normal and remained so until the next evening, about twenty-five hours later, when the diplopia reappeared with equal intensity, and he was again compelled to carry his face to the extreme right to obtain single vision.

The father thinking that this condition would pass off as did the first attack delayed consulting a physician until two weeks later, when becoming alarmed at the persistency of the trouble he brought the boy to me.

I found a complete, isolated paralysis of the right abducens, the eye extremely adducted, and the patient unable to move it to the right beyond the middle line. Examination with the lights revealed a typical picture of paralysis of the right abducens. There was absolutely no trouble with any other nerve. Fundus, accommodation, and vision normal. No trouble in or around the globe or orbit; nor did the closest inquiry lead me to believe that there had been, previous to this time.

Believing that the trouble would finally disappear of itself, I put the patient on a *placebo* and requested him to call every few days, which he did. The condition improved gradually from this time until in about four weeks from the day he first came for treatment he was discharged perfectly well and has remained so for several months.

That this paralysis was due to direct injury, by concussion or contusion, of the nerve at the point where it enters the notch under the posterior clinoid process, produced by the force on the temple jamming the tip of the petrous portion of the temporal bone against the nerve at this point, seems to my mind but little doubtful. The only explanation of the disappearance of the trouble on the first day to reappear the next evening is that there was first concussion of the nerve which passed off, only to be followed by slight inflammation and pressure, thus causing a reappearance of the condition.

ON THE EQUIVALENT REFRACTION OF TWO CYLINDRICAL LENSES.

By HAROLD WILSON, M.D., Detroit, Mich.

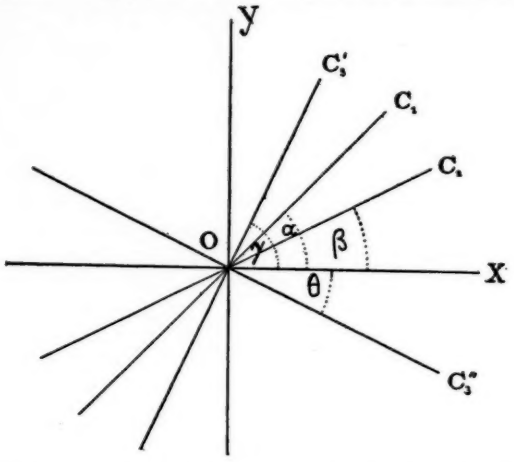
(*With a figure in the text.*)

THE problem of determining the refraction of two cylindrical lenses with their axes at any angle has been solved by a variety of methods. The solution given by Donders [1] is moderately simple, the results being given in terms of radii of curvature. That of Weiland [2] is similar, except that the results are given in dioptries. The solutions of Jackson [3] and Hay [4] involve only elementary mathematics, as does also that of Prentice,[5] but the demonstrations are somewhat cumbersome and complex. That given by Heath [6] is elegant, but involves considerable mathematical knowledge.

The writer ventures to propose another method, by which the solution is easily effected by the aid of some of the elementary principles of the differential calculus. It is to be understood that this solution, in common with others, applies only to thin pencils of light passing through very thin lenses in contact, and at some point very near the axis of the system, the axis of the principal ray being normal to the surface at the point of incidence.

[1] Donders: *Accommodation and Refraction of the Eye*, p. 499.
[2] Weiland: "On the Refractive Value of Any Two Cylinders," etc., Arch. of Oph., 1893, vol. xxii., p. 435.
[3] Jackson: "The Equivalence of Cylindrical and Sphero-Cylindrical Lenses," *Trans. Amer. Oph. Soc.*, 1886, p. 268.
[4] Hay: "On the Combination of Two Cylindrical Lenses," *ibid.*, p. 384.
[5] Prentice: Ref. in Weiland, *loc. cit.*
[6] Heath: *Geometrical Optics*, 1895, p. 186.

Let the optical axis of the system coincide with the axis of z, that is, (Fig. 1,) with the normal at the point O, to the plane of the diagram. The plane of $x\,y$ is tangent to the curved surfaces



at the point O. Let O C_1 and O C_2 be the traces of the planes of least curvature, or axes, of any two cylindrical surfaces or lenses, having a common optical axis, upon the plane $x\,y$, forming with the axis of x the angles α and β respectively. Let O C_3' and O C_3'' be the traces upon $x\,y$ of any two secant planes of the equivalent surface or lens, normal to $x\,y$ at O, perpendicular to each other and forming with the axis of x the angles γ and θ respectively.

By a theorem in Analytical Geometry,

$$\frac{1}{R} = \frac{\cos^2\varphi}{R_1} + \frac{\sin^2\varphi}{R_2} \quad \ldots\ldots \quad (1)$$

where R is the radius of curvature of a normal section of a curved surface, at any point, in terms of R_1 and R_2 the least and greatest radii of curvature of the surface, and of the angle φ formed by that section with the principal section of greatest curvature.

Let φ^1 be the angle formed by any section with the principal section of the least curvature. Then, since $\varphi^1 = 90^\circ - \varphi$, $\varphi = 90^\circ - \varphi^1$, $\cos\varphi = \sin\varphi^1$, $\sin\varphi = \cos\varphi^1$. Equation (1) therefore becomes

$$\frac{1}{R} = \frac{\sin^2\varphi^1}{R_1} + \frac{\cos^2\varphi^1}{R_2} \quad \ldots\ldots \quad (2)$$

Now in a cylinder $R_2 = \infty$, equation (2) therefore becomes for cylinders,

$$\frac{1}{R} = \frac{\sin^2 \varphi^1}{R_1} \quad \ldots\ldots (3)$$

For the radii of curvature we may substitute the corresponding refractive value in dioptries.

When the lens is plano-convex or plano-concave $F = \frac{\rho}{n-1}$ or, as in spectacle lenses, where $n = 1.5$ nearly, $F = 2\rho$, but F in meters $= \frac{1}{D}$, $\frac{1}{\rho} = 2D$, and equation (3) becomes in dioptries

$$D_R = D_{R1} \sin^2 \varphi^1$$

The refraction in any normal plane through the axis of a system of lenses equals the sum of the refraction of the lenses in that plane. Therefore, in plane of section O C_3' (Fig. 1) the refraction of $C_1 = C_1 \sin^2 (\gamma - \alpha)$, the refraction of $C_2 = C_2 \sin^2 (\gamma - \beta)$, adding,

$$C_3' = C_1 \sin^2 (\gamma - \alpha) + C_2 \sin^2 (\gamma - \beta) \quad \ldots\ldots (4)$$

Similarly, in plane of section O C_3'', the refraction of $C_1 = C_1 \sin^2 [90^\circ - (\gamma - \alpha)] = C_1 \cos^2 (\gamma - \alpha)$. The refraction of $C_2 = C_2 \sin^2 [90^\circ - (\gamma - \beta)] = C_2 \cos^2 (\gamma - \beta)$.

$$C_3'' = C_1 \cos^2 (\gamma - \alpha) + C_2 \cos^2 (\gamma - \beta) \quad \ldots\ldots (5)$$

where C_1 equals the maximum refractive value of the first cylinder, C_2 that of the second, C_3' the refraction of the equivalent surface or lens in the plane of O C_3', and C_3'' that in the plane of O C_3''.

By definition, the astigmatism of any refracting surface is equal to the difference between the refraction in the planes of greatest and least curvature of that surface.

We may assume that O C_3' and O C_3'' are in the principal planes of the equivalent surface, since the normal sections of greatest and least curvature of any surface are perpendicular to each other.

I. In the equivalent surface, to determine the principal section of least curvature and the angle formed by the trace of this section on the plane $x\,y$ with the axis of x.

Let C_3 = the astigmatism of the equivalent surface or lens. θ = the angle formed by the trace of the principal section of greatest curvature with the axis of x.

Then the equation

$$C_3 = [C_1 \cos^2(\theta - \alpha) + C_2 \cos^2(\theta - \beta)] - [C_1 \sin^2(\theta - \alpha) + C_2 \sin^2(\theta - \beta)]$$

being the difference between equations (4) and (5), represents the astigmatism of the equivalent surface or lens. Reducing,

$$C_3 = C_1 [\cos^2(\theta - \alpha) - \sin^2(\theta - \alpha)] + C_2 [\cos^2(\theta - \beta) - \sin^2(\theta - \beta)]$$

and since $\cos^2 \varphi - \sin^2 \varphi = \cos 2\varphi$,

$$C_3 = C_1 \cos 2(\theta - \alpha) + C_2 \cos 2(\theta - \beta)$$

and since $\cos(\varphi - \varphi^1) = \cos \varphi \cos \varphi^1 + \sin \varphi \sin \varphi^1$

$$C_3 = C_1 \cos 2\theta \cos 2\alpha + C_2 \sin 2\theta \sin 2\alpha + C_2 \cos 2\theta \cos 2\beta + C_2 \sin 2\alpha \sin 2\beta.$$

$$= \cos 2\theta (C_1 \cos 2\alpha + C_2 \cos 2\beta) + \sin 2\theta (C_1 \sin 2\alpha + C_2 \sin 2\beta) \ldots\ldots (6)$$

Equation (6) gives the value of the astigmatism in terms of the variables C_1, C_2, θ, α, and β.

To determine the value of θ when C_3 is a maximum, that is, to determine the position of the plane of maximum refraction, we may assume C_1, C_2, α and β to be constants. $C_3 = f(\theta)$.

It can be shown by the differential calculus than when $u = f(\theta)$ is a maximum or minimum.

$$\frac{d\,u}{d\,\theta} = 0$$

When u is a maximum

$$\frac{d^2\,u}{d\,\theta^2} < 0$$

When u is a minimum

$$\frac{d^2\,u}{d\,\theta^2} > 0$$

Forming the differential co-efficient of C_3 with respect to θ,

$$\frac{d\,C_3}{d\,\theta} = -2 \sin 2\theta (C_1 \cos 2\alpha + C_2 \cos 2\beta) + 2 \cos 2\theta (C_1 \sin 2\alpha + C_2 \sin 2\beta)$$

Placing this result equal to zero, transposing and dividing we have

$$\frac{\sin 2\theta}{\cos 2\theta} = \tan 2\theta = \frac{C_1 \sin 2\alpha + C_2 \sin 2\beta}{C_1 \cos 2\alpha + C_2 \cos 2\beta} \ldots\ldots (7)$$

$$\frac{d^2\,C_3}{d\,\theta^2} = -4 \cos 2\theta (C_1 \cos 2\alpha + C_2 \cos 2\beta) - 4 \sin 2\theta (C_1 \sin 2\alpha + C_2 \sin 2\beta)$$

Expressing cos 2θ and sin 2θ in terms of tan 2θ from equation (7), putting $C_1 \cos 2\alpha + C_2 \cos 2\beta = A$, and $C_1 \sin 2\alpha + C_2 \sin 2\beta = B$, we have

$$\frac{d^2 C_3}{d \theta^2} = -4 \left(\frac{A}{\sqrt{1 + \tan^2 2\theta}} + \frac{B \tan 2\theta}{\sqrt{1 + \tan^2 2\theta}} \right)$$

and since $\tan 2\theta = \frac{B}{A}$, reducing,

$$\frac{d^2 C_3}{d \theta^2} = -4 \sqrt{A^2 + B^2} = < o \quad \ldots\ldots (8)$$

Therefore, when tan 2θ has the value given in equation (7), the value of C_3 given in equation (6) is a maximum, and the position of the plane of greatest curvature of the equivalent surface or lens is found. To find the position of the plane of least curvature, *i. e.*, the position of the axis of the equivalent sphero-cylindrical lens, we have

$$\text{Angle } \gamma = 90^\circ - \theta, \; 2\gamma = 180^\circ - 2\theta,$$

$$\tan 2\gamma = \tan 2\theta, = \frac{C_1 \sin 2\alpha + C_2 \sin 2\beta}{C_1 \cos 2\alpha + C_2 \cos 2\beta} \quad \ldots\ldots (9)$$

II. In the equivalent surface, to determine the total astigmatism.

Substituting in equation (6) the values of sin 2θ and cos 2θ in terms of tan 2γ, we have

$$C_3 = \frac{C_1 \cos 2\alpha + C_2 \cos 2\beta}{\sqrt{1 + \tan^2 2\gamma}} + \frac{\tan 2\gamma \, (C_1 \sin 2\alpha + C_2 \sin 2\beta)}{\sqrt{1 + \tan^2 2\gamma}}$$

substituting the values of tan 2γ and reducing,

$$C_3 = \sqrt{C_1^2 + C_2^2 + 2 C_1 C_2 \cos 2 (\alpha - \beta)} \quad \ldots\ldots (10)$$

III. In the equivalent sphero-cylinder to determine the spherical element.

Since the equivalent surface may be replaced by a sphero-cylindrical lens: the refraction in the plane of O C'_3 (this being the meridian of least curvature, and its astigmatism being equal to zero), if D = the spherical lens of the sphero-cylinder,

$$C'_3 = D \quad \ldots\ldots (11)$$

The refraction in the plane OC''_3 (this being the meridian of greatest curvature), is then

$$C''_3 = C_3 + D \quad \ldots\ldots (12)$$

Adding (11) and (12) and substituting the values of C'_3 and C''_3 from equation (4) and (5),

$$\begin{aligned} C'_3 + C''_3 &= C_1 \sin^2 (\gamma - \alpha) + C_2 \sin^2 (\gamma - \beta) \\ &+ C_1 \cos^2 (\gamma - \alpha) + C_2 \cos^2 (\gamma - \beta) \\ &= C_1 + C_2 = C_3 + 2 D, \end{aligned}$$

since $\sin^2 \varphi + \cos^2 \varphi = 1$.

$$\therefore D = \frac{C_1 + C_2 - C_3}{2} \quad \ldots\ldots (13)$$

The general problem is thus solved. Of the equivalent spherocylindrical lens, the value of its cylindrical element is given in equation (10), the position of its axis by equation (8), and the value of its spherical element by equation (13).

For the Stokes lens, $C_1 = C_2$, $\beta = 0$, $\sin 2\beta = 0$, $\cos 2\beta = 1$, and equation (9) becomes

$$\begin{aligned} C_3 &= \sqrt{2 C_1^2 - 2 C_1^2 \cos 2\alpha} = \sqrt{2 C_1^2 (1 - \cos 2\alpha)} \\ &= \sqrt{2 C_1^2 (2 \sin^2 \alpha)} \end{aligned}$$

$$C_3 = 2 C_1 \sin \alpha \quad \ldots\ldots (13)$$

Equation (8) becomes

$$\tan 2\gamma = \frac{\sin 2\alpha}{\cos 2\alpha + 1} = \tan \alpha$$

$$\gamma = \frac{\alpha}{2} \quad \ldots\ldots (14)$$

That is, the axis of the equivalent cylinder bisects the angle formed by the axes of the cylinders. Equation (13) becomes

$$-\frac{C_3}{2} = D \quad \ldots\ldots (15)$$

EXTIRPATION OF AN ORBITAL CYST BY TEMPORARY RESECTION OF THE EXTERNAL ORBITAL WALL AFTER KRÖNLEIN'S METHOD.

By Dr. W. KLINGELHÖFFER, Mannheim, Germany.

Translated by Dr. A. B. Kibbe, Seattle, Wash.

March 1, 1895, Elsie W., aged nine months, was brought by her mother to Professor Weiss's clinic in Mannheim, with the statement that the infant's right eye had become larger since birth. Further questioning elicited the following :

Though labor had been difficult the aid of a physician had not been necessary. On bathing the child soon after its birth the midwife noticed a drop of blood and mucus at the inner angle of the right lids, which reappeared after being wiped away. At the same time it was noticed that the eye appeared larger than its fellow. In addition a squint was observed during the first four weeks. The child had always appeared healthy, and so far as was apparent suffered no pain. Convulsions had never occurred.

Examination of the skull showed no deviation from the normal, and the fontanelles were not prominent. The left eye was normal, but the right markedly protruding, particularly downward and inward. Motion outward restricted. The upper lid bulging and marked by tensely filled veins. Conjunctiva, cornea, and iris normal. Pupil dilated and fixed.

Satisfactory ophthalmoscopic examination was very difficult, owing to the restlessness of the child. It, however, showed the absence of choked disc, but the papilla was pale, and the retinal arteries narrow.

No tumor could be felt in the orbit in spite of careful and thorough examination.

The objective symptoms, complete rigidity of the pupil and the paleness of the papilla, pointed to either an amaurosis or at least to a high grade of amblyopia.

These findings, together with the exophthalmus, indicated plainly a tumor deep in the orbit. All evidence of an inflammatory process, fever, pain, redness, and swelling, was wanting, and orbital aneurism could be excluded by the absence of pulsation and bruit.

Taking the age of the child into consideration, the first thought would be of a tumor of the optic nerve. In favor of this hypothesis was the slow and painless increase of the exophthalmus without inflammatory symptoms. Against it, however, was the direction of such exophthalmus. The eye protruded inward and downward, while in typical cases of optic-nerve tumor the globe is pushed forward in the direction of the orbital axis—that is, downward and outward. In addition to a tumor of the optic nerve the question of an angioma was also to be considered, and particularly of the cavernous variety which occasionally is congenital. Against the assumption that our case was of this nature was the absence of spontaneous increase and decrease, and, further, that a variation in volume was not to be produced by mechanical action. The age of the child excluded carcinoma. Cystic formation was also possible, either dermoid or hematoma. But, as already stated, the tumor, not being accessible to palpation, no fluctuation could be demonstrated, which is often the case in orbital tumors. An absolute diagnosis could not be made. It was, therefore, decided to wait in order to observe whether or no the exophthalmus increased. In the latter case operative procedure would be undertaken, as, aside from the deformity due to the displacement of the eye, the incomplete closure of the lids might easily lead to keratitis or even to atrophy of the globe. An operation in comparison with these possible evils presented no objection, as in the method described by Krönlein of temporary resection of the outer wall of the orbit we have a procedure which has proved itself valuable in all cases, and which permits access to the contents of the orbit without injury to the globe.

July 13, 1895, the operation was decided upon and performed by Prof. Weiss and Dr. Heuck in the hospital at Mannheim. The child having been chloroformed, a cutaneous incision was made

diagonally from above outwards, downwards, and inwards in such a way that the height of its convexity reached the middle of the outer edge of the orbit. The incision was carried down to the fascia and periosteum, which were divided close to the edge of the orbit, and the periorbital tissues separated from the bone as far as the vicinity of the infraorbital fissure. After dividing the periosteum the external angular process of the frontal bone and the frontal process of the malar were chiseled through toward the infraorbital fissure. In the case of the latter the periosteum was preserved. It was now easy to displace the particle of bone lying between the incisions outward, and in this way obtain lateral access to the posterior portion of the orbit. Following this, the periorbital tissues were opened longitudinally. Through the opening so made the retrobulbar fat at once protruded. This having been pushed aside, a tense, tendinous sack of a bluish lustre at once appeared in the wound, and being seized with forceps was readily separated in its anterior portion. While endeavoring to loosen its wall in the deeper portion of the orbit severe hemorrhage occurred and obscured the field of operation. Attempts in this direction resulted in incising the cyst wall, which was followed by collapse of the cyst with the exit of a small amount of fluid. During further efforts to follow the cyst deeper, so profuse a venous hemorrhage occurred from the upper and posterior portion of the orbit that the operation was interrupted after removing as much of the cyst wall as was possible. The posterior portion of the orbit was firmly tamponed with iodoform gauze and a dry dressing applied. Two days later Prof. Weiss believed that so firm a coagulum had formed that the operation might be completed. Removing the dressing showed the wound free from irritation and without abnormal secretion. Chloroform having been again administered, the tampon was carefully removed, the collapsed and tendinous sack placed upon the stretch and followed farther down. As it appeared to be firmly attached on all sides of the orbital fissure it was tightly stretched and as far as possible completely removed with the scissors. A tampon was introduced, the resected portion of bone replaced in its proper position, the edges of the wound closed with five silk sutures and a dry dressing applied. After the completion of the operation the globe was still prominent. July 22d the dressing was changed for the first time. Lids slightly swollen and eye free from irritation, but stands in a markedly convergent position. The prominence has

almost disappeared. Patient was discharged from the hospital on the 27th of July.

The wall of the cyst which had been removed was placed in absolute alcohol and given to me by Prof. Weiss for more exact examination. It consisted of three pieces having a total weight of about 300 mg. The first piece was seven *mm* long and four *mm* wide, the second ten *mm* long and four *mm* wide, the third twenty-three *mm* in length and eleven in width. Macroscopically the inner surface of both small pieces is smooth and of whitish color. The larger piece is irregular and quadrangular in form. The thickness of its walls varies. At the point where the perforation occurred and in its vicinity it is as thin as paper, while in other portions it reaches a thickness of one *mm*. A microscopic examination of the first piece shows the wall to be formed of two layers, the external composed of adipose tissue, the second of tense connective tissue with wavy fibres running parallel with the surface. Between the fibres, on the surface more numerous than in the middle, are long, spindle-shaped cells with nuclei staining deeply with hematoxylin. Here and there toward the inner surface a third layer appears staining a light blue with hematoxylin, but in general not showing any detailed structure.

Sections from the wall of the larger piece show essentially the same layers. Toward the interior of the cyst the tissue is equally rich in nuclei. The same features were repeated in all sections. It is particularly noteworthy that at no point were typical epidermis, sebaceous or sweat glands found. Before deciding upon the character of the cyst it is permissible to consider such cysts as have been observed in the orbit up to the present time. Berlin divides orbital cysts into two principal groups, cephaloceles and true cysts.

I.—CEPHALOCELES.

Congenital cephaloceles are located at the root of the nose and from there extend either to the brow, nasal cavities, or the orbit. The point of the entrance on the inner surface is found at the junction of the frontal and ethmoid bones, at

times at the side and at other times in the centre. In their further course they may then extend in three different directions, either to the area immediately above the nasal bone, or between the ethmoid on one side and the frontal and nasal bones on the other. These naso-ethmoidal cephaloceles then extend in front of the ethmoid after displacing it downwards and inwards to the nasal cavities and appear beneath the skin between the cartilaginous and bony nose, or they may force their way into the orbit through a defect in either the lachrymal bone or the frontal process of the superior maxilla. They then lie on the inner side external to the muscles. In the rarest cases the tumor may extend in the third way, that is, through an opening at the point of union of the ethmoid, frontal, and lachrymal bones. In this case also the cephaloceles will lie at the inner side of the orbit. But few positive examples of this form of cerebral hernia are known. In the orbit all three of these types have been observed, meningoceles, cephaloceles, and hydro-cephaloceles. The characteristic point of typical cerebral herniæ occurring in the vicinity of the orbit is their location at the inner side. A congenital tumor in this locality should therefore always arouse our suspicion. Its size has little diagnostic value, as it may undergo marked variation in size, varying from a scarcely perceptible swelling to one reaching the size of a child's head. The amount of space occupied by the tumor in the orbit is dependent upon its position in addition to its size; the farther back its point of entrance the greater will be the protrusion of the globe. If the point of entrance lie near the rim of the orbit a displacement of the globe outwards only will take place. In such cases the surface of the tumor may lie directly under the skin. Its external covering may be either unchanged, greatly thinned, or excoriated and marked with scars of previous inflammation. The skin also may present a bluish discoloration and is often adherent to the sack. In a few cases cerebral hernia has been complicated with vascular tumors, lipomata and fibromata. Finding a tumor at the inner side of the orbit which fluctuates and is transparent is suspicious of cephalocele. Fluctuation we may earliest expect in meningoceles, and in addition

transparency which is dependent upon the amount of fluid. As further symptoms of cerebral hernia may be mentioned pulsation and variation in volume in expiratory movements. These qualities belong particularly to cephaloceles. Pressure upon the tumor, particularly in meningoceles, produces partial reposition, occasionally total, and if during this experiment symptoms arise pointing to an increase in intracranial pressure the diagnosis of cerebral hernia is assured. Giddiness, embarrassed respiration, weakness of the pulse, convulsions, and vomiting occur, but cease at once when pressure is removed. In a few cases bilateral cephaloceles have been observed. Small sincipital cephaloceles give the best prognosis. As far as treatment is concerned, Berlin considers them as a *noli me tangere*. As already stated, the prognosis of large cerebral hernia is bad. Characteristic as are symptoms of typical orbital cephaloceles, the diagnosis is difficult if the path of connection with the cranial cavity is very narrow. Often this canal contains a valvular formation permitting fluid to pass into the tumor but not back again. In such cases pulsation and expiratory variations are wanting and attempts at reposition produce neither a lessening in the size of the tumor nor symptoms of increased cerebral pressure. Such formations have repeatedly been taken for cysts from constriction until by injection of tincture of iodine or operative procedure symptons of meningitis set in leading to the patient's death.

In all cystic tumors of the head, but particularly when situated at the site of predilection for cephaloceles, the underlying bone must be most carefully examined for possible defects, and farther in assimetries or malformations of the skull. What has been said with reference to the difficulty of diagnosis in cephaloceles with narrow point of connection with the cerebrum is applicable to that rare group which Berlin designates as cysts from constriction.

II.—TRUE CYSTS.

a.—Cysts from Constriction.

These are analogous to serous cysts which occasionally are found in other portions of the skull and must be con-

sidered as congenital meningoceles. A large number of such tumors have been observed in various portions of the head. In a few cases they lay in excavations in the bones or over bony fissures which had undergone membranous occlusion. The number of such cysts found in the orbit is small. Berlin reports two cases. In one the cystoid sack contained no fluid while adjacent to it lay two cerebral herniæ. The second case occurred in a man twenty years of age, psychically well developed and showing no cerebral disturbances. The tumor, which filled the entire left orbit, had existed since his eighth year. The orbit was dilated, the brow of the left side altered and beneath the lower lid a plainly fluctuating tumor was visible. The patient died from meningitis following an operation and the autopsy showed that the cyst not only included the entire left orbit but had extended through the dilated optic foramen into the brain. At a similar spot on the other side a cyst was found about a pigeon's egg in size. Microscopic examination of the fluid obtained from these cysts by aspiration would show the absence of the characteristic elements of dermoids and of hooklets and echinococcus membranes. There are no characteristic microscopic findings in cephaloceles. Their walls and their derivates consist of more or less markedly altered meninges. If a portion of the cerebrum has found its way into the sack, the brain-substance may be unchanged in cases where the opening is large, or become a thin membrane adherent to the walls.

b.—Extravasation Cysts.

Under the name extravasation cysts we include with Berlin all those cysts which are found in literature under the titles: blood cysts, hematomata of the orbit, etc. A certain number of the reported cases were simply encapsuled extravasations of blood in the retrobulbar tissue. These do not deserve the name of blood cyst, and are to be excluded. The majority of the others, also, will not stand accurate examination. As a rule they were dermoids, in which puncture or injury led to hemorrhage. Even vascular tumors have been included in this group. The question now arises whether it is possible to diagnose a blood cyst before opera-

tive procedure has been instituted. The case history alone would direct our attention to such a condition. Evidence of trauma and the statement that the eye showed evidences of subcutaneous hemorrhage are points which are here to be considered. Given a patient with such a case history, and with the further history that following the trauma exophthalmus took place, finding a cyst in the orbit, and exploratory puncture showing its contents to be blood, do not give sufficient points upon which to base a diagnosis. Most exact microscopic examination of the contents and of its walls is still requisite. Only in case that a wall is present and fails to show at any point an epithelial layer, and when, further, in its contents nothing of a dermoid nature can be demonstrated, is it permissible to speak of an extravasation cyst.

c.—Exudation Cysts.

In addition to the case published by Berlin, as far as I am aware, but one other is in existence, that of Saltini, in a man forty-seven years of age. Exophthalmus of the right eye had been greatly increasing for two years. Puncture evacuated a chocolate-colored fluid. Opening the cyst and washing it out with a one-per-cent. solution of carbolic acid, followed by injection of tincture of iodine, produced a cure. Saltini made the diagnosis of a hygroma of the bursa between the levator palpebræ superioris and the superior rectus. To make so exact a diagnosis as to location without operative exposure of the cyst I believe to be very difficult, if not impossible.

d.—Dermoids.

By far the most frequent form of cystic tumors occurring in the orbit are the dermoids. Berlin cites seventy-three. Yet only a portion of these are unquestionable. We may distinguish with Mitvalsky between cysts of the rim of the orbit which have secondarily extended into the orbit and true orbital cysts. With reference to the genesis of dermoids of the orbit, Mikulicz considers them to have originated from the structures giving rise to the lens. Whether dermoids at the external edge of the orbit have the same origin

is questioned by Mikulicz. These cysts are, of course, always congenital, but only a small number are so recognized. This arises from the fact that in the beginning they are, as a rule, small and only increase in size later. The age of puberty is the time when rapid growth takes place. We therefore find that 82 per cent. come under observation between the first and the twentieth year, and only 18 per cent. after this time. Injury or inflammation of adjacent tissue may cause the appearance of a cyst which up to that time has been latent. Various views were held relative to the location of orbital dermoids until Berlin demonstrated, by a study of fifty-one cases, that the medial side of the orbit was the point of predilection, and that, in the majority of cases, they lie outside of the cone formed by the muscles. In size they vary greatly. That described by Hecht[1] was very large, and was further characterized by the tendency which it showed to erosion of neighboring bone. The case of Lapersonne,[2] a cyst of the brow which perforated the roof of the orbit, is a further example of this. In addition to this, dermoids also exhibit a tendency to form adhesions with the frontal fascia, more rarely with the muscles, the globe, or the optic nerve. Orbital dermoids, like those occurring in other portions of the body, have in their walls a connective-tissue substratum and an epithelial layer. The connective-tissue base as well as the corium consists usually of a loose external layer of connective tissue and an inner portion more fibrous in character. The connective tissue may form papillæ; usually, however, only in such areas as contain hair follicles. Above the corium lies the epidermic layer. Here the epithelium may be laminated just as it is in the external skin. In many cases, however, only a rudimentary epidermic coat exists, formed of flattened cells. All the structures of epidermis may be observed in dermoids —hair follicles, partly abnormal in size, partly deformed; hairs which are like cilia, and may or may not contain pigment; sweat glands, and, in one case, a tooth. The contents of the cysts are formed by the products of its walls,

[1] "Dermoidcysten der Orbita," *Inaug. Diss.*, Würzburg, 1891.
[2] "Fronto-orbital Dermoid Cyst," *N. Y. Med. Jour.*, Jan., 1893.

the major portion consisting of cast-off layers of the stratum corneum of the epidermis. The sebaceous glands produce particles of fat; the sweat glands, a watery fluid without histological elements. Loosened hair may also be present. A portion of the fat may appear in the form of cholestearin crystals. If numerous sebaceous glands are present, fat may prevail in such quantity as to fill the entire cyst, and we then have the so-called oil cysts. The symptoms produced by dermoids present but little which is characteristic in contrast to other orbital cysts. Their location need scarcely be considered. Although the nasal side, as already mentioned, is that of predilection, other forms of cysts, particularly cephaloceles, may occur in the same place. In common with other cysts dermoids may present fluctuation, though this symptom may be wanting if the contents are semi-solid. In this case we would find the so-called pitting, but if seated deeply in the orbit this could seldom be demonstrated. If expiratory puncture showed the contents to be fat, the diagnosis might be made with certainty; while if a serous, thin fluid was obtained, this would be against a dermoid even although it has been occasionally observed. With reference to treatment, simple puncture of the cyst presents no prospect of a cure. In many cases such procedure, when accompanied by injection of an irritating fluid, such as tincture of iodine, may be successful. Partial extirpation is only injurious if a fistula results. A radical cure can only be obtained by thorough extirpation either through the lids, or, better and more conveniently, by temporary resection of the outer wall of the orbit by Krönlein's method, which permits a view of the entire orbit without injury to the globe.

e.—Mucous Cysts.

Becker describes a congenital cyst, hazel-nut in size, at the inner angle of the lids, which extended from a point three and one-half centimetres from the inner wall of the orbit backward as far as the optic nerve. Puncture evacuated a cloudy glycerine-like fluid. The operation showed that the cyst contained a large amount of mucus, and apparently communicated with the nose, as fluid injected into the cyst

flowed rapidly out of the nose. Microscopic examination showed a layer of stratified cylindrical epithelium with goblet cells in the connective-tissue walls. The cyst originated from a fœtal exclusion of a portion of the nasal mucous membrane.

In conclusion mention may be briefly made of a further form of orbital cyst due to a parasite.

f.—Echinococcus Cysts.

Up to the present time thirty-eight cases of echinococcus cysts in the orbit are known. Weeks[1] collected thirty-three and to this number Rabinovitch[2] has added five more. They are observed either as simple cysts up to the size of a pigeon's egg, or there may be from three to ten vesicles from the size of a lentil to that of a nut. As a rule the parasites are enclosed in a connective-tissue capsule. Stellwag's opinion that the upper inner angle of the orbit is the point of predilection cannot be sustained, as they are quite as often observed at other points either within or without the cone of muscles, and are occasionally found in the lachrymal glands and in the sheath of the optic nerve. Of diagnostic importance are the pains in the posterior portion of the eye or in the temporal region which may extend over the entire side of the head and usually increase in severity at night. In addition a slowly increasing exophthalmus takes place. An elastic fluctuating tumor can occasionally be felt in some portion of the orbit. The so-called hydatid purr has also been observed. Increase in size of the tumor may lead to erosion of the bone. As previously mentioned, echinococcus cysts contain a clear fluid of neutral or alkaline reaction and a specific gravity of 1008 to 1013. Scolices, hooklets, or portions of the characteristic membrane may be demonstrated microscopically. Treatment consists either in puncture with drainage or in radical operation.

In considering the type of cysts which we have described, a cephalocele may be at once excluded, as no communication was found with the cranial cavity. There is no evidence that it was a mucous cyst. Hematoma, which according

[1] ARCH. OF OPHTHALM., xviii., 1889, p. 31; *Arch. of Augenheilk.*, xxi., 1890, p. 206.

[2] *Centralbl. f. Augenheilk.*, xviii., 1894, p. 359.

to the case history might have been suspected, could be excluded by the microscopic findings. In favor of a dermoid was the fact that the tumor was congenital, and further, the relative frequency of that form of cyst in the orbit. Epidermis, however, in every form of its derivative was wanting. In favor of the assumption that the case was an exclusion cyst was the fact that it was congenital, and that it could be followed by aid of an apparent pedicle to the vicinity of the superior orbital fissure. A comparison of the microscopic picture of the cyst wall with preparations of the meninges of a child which had been prepared especially for this purpose showed some similarity between it and the dura. In both, loose strands of connective tissue containing spindle-shaped cells ran parallel with the surface. It is true that the inner layers of the cyst were wanting in endothelium, but this is not so remarkable since the meninges in almost all cases of cephalocele are found markedly altered. Nerve elements were completely wanting in the cyst. From these facts it is apparent that the weight of evidence is in favor of the diagnosis or a cyst from constriction, but it appears impossible to me to make such a diagnosis with certainty, as a dermoid cannot be excluded absolutely. Late in 1896 examination of the child showed the following conditions: the right eye is markedly convergent; the pupil dilated and fixed; ophthalmoscopic examination shows the papillæ to be pale. Holding the sound eye closed the child grasps at objects held in front of it, so that it appears as though some vision was present.

FOUR CASES OF IRON FOREIGN BODIES REMOVED FROM INTERIOR OF THE EYE WITH HAAB'S ELECTROMAGNET.

By R. BARKAN, M.D., San Francisco.

Case 1.—*Chips of iron from a horse-shoe entered through the sclerotic. Extracted through the opening through which it had entered. Suppuration. Enucleation.*

A. L. Shaffer, Oakdale, California, whilst removing a shoe from a horse, on December 22, 1896, with a cold chisel and hammer, to cut the nail, was struck in the right eye by a flying metallic fragment, which penetrated into the ball; great pain and photophobia ensued; the eye was examined by a general practitioner who applied some drops.

Status præsens.—The patient quite weak, partly due to use of liquor and pain. Lachrymation, slight muco-purulent discharge adherent to the lashes of upper and lower lids. The lids are considerably swollen, leaving only a slight aperture. Considerable chemosis of upper half of ocular conjunctiva overlapping the cornea, particularly the region of the wound, situated at the outer and lower part of the corneal margin; slight chemosis and hemorrhage in the lower part of the conjunctiva. Grayish-white threads of mucoid tissue and iris protrude from the wound. The anterior chamber is shallow and partly filled with a cobweb-like effusion of blood. Iris fairly but irregularly dilated by atropia. Tension slightly diminished, eyeball somewhat sensitive to pressure, sudden movements of the eye followed by pain. V = fingers at 6 ft. Projection good. Lens apparently clear, red fundus shines through the pupil—no details. A foreign body is not visible.

When the patient's eye was approached to the sideroscope (of Asmus), the region of the wound being brought within a distance of ¼ inch from the tube, the needle which had previously

only lightly oscillated from movement of street traffic, became suddenly so powerfully deflected that the oscillations could be observed with the naked eye. The presence of a metallic foreign body in the eye was thus conclusively proved. The eye was carefully washed and made as nearly aseptic as possible.

Steadying the patient's head and eyelids, I approached the wounded eye within 1 inch of the pole of the large magnet, when the current was turned on. For one second, the patient felt a keen pain, in the next second, the foreign body, as if by magic, flew to the pole; the foreign body weighed 0.0708 gramme.

Considering the possibility of there being another metallic particle in the eye, the patient's eye was, according to Haab's suggestion, approached a second time to the magnet, and the current closed; this time, however, there was no pain and no foreign body forthcoming. Then the eye was cleansed—the wound trimmed; atropin; bandage; and the patient removed to the Lane Hospital.

It is impossible for me to refrain from stating that the momentous, brilliant extraction of the foreign body from the first eye on which I had operated with Haab's magical magnet, passing through the same opening by which it had entered, and which had neither been changed nor enlarged, was one of the most surprising and grateful moments of my professional life. Undoubtedly the foreign body had penetrated into the vitreous and was invisible—then, apparently with a minimum of traumatism to the eye, it followed, whilst on its exit, the channel offering the least resistance, the one it had prepared whilst entering, obeying the magnetic call of Haab's magnificent instrument. Any confrère who has searched in the vitreous, mostly through a freshly made sclerotical section, for a foreign body, destroying vitreous at every moment of the generally repeated introduction of Hirschberg's hand magnet, can imagine the happiness I experienced in extracting the foreign body, without touching the eye, or wound, with any instrument whatever, and will agree with me that the expense and trouble of bringing the ponderous instrument from Zurich to the Pacific coast are amply repaid.

Aside of a few severe shooting pains experienced by the

patient some hours after the extraction, the eye did very well under atropin and bandage. Lid swelling and chemosis decreased markedly, pupil almost completely enlarged, and 40 hours after extraction V = $\frac{8}{200}$; patient recognized my features; no pain; ate and slept well.

For three days after the extraction, the patient's condition was all that could be desired. On the evening of the fourth day, severe pain set in, subsequent to an attack of sneezing, which hurt him somewhat. Hot applications, cocain and leeching failed to afford relief—so severe and lasting was the deep throbbing pain that morphine had to be administered repeatedly; then came the swelling of lids and ocular conjunctiva. For over three weeks intense infectious irido choroiditis was progressing. On January 21st, the condition was: Upper and lower tarso-orbital folds œdematous, slight lachrymation. No ocular chemosis, but a good deal of conjunctival and subconjunctival injection. Remains of hemorrhagic effusion behind the cornea. No anterior chamber. Pupil irregular in outline, but fairly dilated. Iris discolored and undergoing atrophy. Some capsular spots. Lens seems clear, space behind the lens filled with grayish-yellow exudation. No blood-vessels or other sign of organization discernible. No fundus reflex. Tension diminished (−1), slight sensitiveness to touch. Projection of light defective above and below. Sees motions of hand indistinctly.

Patient was dismissed temporarily and I hoped the storm would blow over, and at any rate the eyeball be saved.

After leaving the hospital, tenderness and redness gradually subsided; no sharp pains; eyeball became nearly white, but remained slightly sensitive.

Four weeks later the lids were somewhat swollen, eyeball flattened down a little. No anterior chamber. Pupil widely dilated. Iris atrophic at pupillary edge. Glaring yellow reflex from behind, uniform mass of exudation filling the rear of the eye. No fundus reflex; tension −2; globe quite sensitive to pressure; V = 0. *Left eye* normal. V = $\frac{20}{20}$. Enucleation advised. Operation accepted. Patient made good and uneventful recovery.

Considering the fact that the foreign body was removed with ease, through the same corneo-scleral wound it had entered, only 24 hours later, it seems certain that infectious germs had been carried into the eye from the horse's hoof,

by the foreign body. They developed and caused the loss of the eye.

CASE 2.—*Chip of iron fastened in cornea, projecting into the anterior chamber. Extraction with large magnet. Recovery.*

Edwin Creba, twenty-one years of age, employed in a blacksmith's shop, whilst cutting the clinch of a horse-shoe nail, was struck in the right eye by a flying fragment at noontime on the 25th of February, 1897. He presented himself a few hours later at my office.

Status præsens.—Lids normal, some conjunctival hyperæmia, but no secretion. No chemosis, slight photophobia, no pain. About the middle of the lower and outer quadrant a bright, scale-like metallic body about 2 x 1 millimetres is seen imbedded in the cornea; obliquely passing through its fibres, it *very* slightly but distinctly protrudes into the anterior chamber, whilst anteriorly the corneal fibres pass flush over the foreign body, which is normal as regards size and clearness. Iris evidently uninjured; pupillary reaction, fundus and V normal. As the metallic body was tightly fixed in the cornea, and its anterior end covered by corneal tissue, I was somewhat in doubt whether Haab's electromagnet would extract it; the eye was cleansed, cocainized, and ten minutes after the patient's entering my office he was approached within one half an inch of the pole, in such a way that the wound coincided with the force lines of the magnet. In three seconds from the time of closure of the current, the foreign body adhered to the pole of the instrument. To all appearances there was hardly any aqueous lost, for the anterior chamber was intact. Patient suffered a sharp momentary pain, but nevertheless was most joyously surprised at being thus quickly relieved of the foreign body. Atropia, bandage; no pain, no inconvenience the following night. The next day showed slightly increased conjunctival hyperæmia, no discharge, no pain, pupil well enlarged. Patient made a speedy recovery. Vision normal. He returned to his work shortly afterwards. The foreign body weighed 0.05 gm.

CASE 3.—*Chip of iron entered into the vitreous through cornea and lens. Extraction through the cornea. Recovery.*

Arthur Doty, of Elk Grove, Sacramento, met with an accident to his right eye similar to Case 2, on the evening of May 27th.

Whilst cutting a clinched nail from a horse's hoof with a hammer and chisel, a fragment flew into his eye. He applied first of all to my colleague, Dr. Briggs, of Sacramento, who, though his experience in connection with the railroad shops of the Southern Pacific at Sacramento has been extensive and successful in removing particles of steel from the eye with the small magnet, kindly referred the patient to me, in order that he might have the benefit of a trial with Haab's large magnet.

Status præsens, May 28th.—Slight lachrymation and pain, lids intact, palpebral, slight pericorneal and conjunctival injection; a very little below and inward from centre of cornea a small scar visible, pupil well enlarged by atropia. No iritis. A small scar on anterior capsule, and a much larger one further upward on the posterior capsule, clearly indicated the track of invasion, travelled by the minute foreign body, on its way into the vitreous. The offending particle of metal was easily detected; it moved readily with the eyeball. Fundus clear and intact. Tension normal. $V = \frac{20}{200}$.

After cocainization and application of a few drops of atropin, the closed corneal wound was re-opened and slightly enlarged, whereupon a few drops of aq. humor spurted out. On closing the current for ten seconds, for the first time the magnet was without effect. Opening the circuit and closing again, the minute foreign body at once appeared in the anterior chamber; it lay flush against the cornea, a little below the wound; from that position, although the eye was made to look downward, the magnet failed to move it, and it would not pass through the corneal wound; the latter was then slightly enlarged with a Graefe knife; again a few drops of aq. humor escaped; the foreign body now adhered to the front surface of the iris, and was shy of the magnetic attraction of the pole held in contact with the cornea. The thinnest tip of Hirschberg's magnet was then introduced through the wound, close to the foreign body, without effect, and it was only after the pole of Haab's magnet was introduced into the opened wound that the foreign body was attracted and extracted. No pain. Pupil fairly regular. Atropin, bandage. During the following few days the pupil enlarged uniformly, no reaction to speak of, no pain, but the lens had become extensively opaque. In the course of the next few weeks the lens was once needled; gradual absorption took place, and now, August 30th, in the centre of the cornea, just below the horizontal meridian, is a fine

linear scar one and a half line in length, anterior chamber normal, pupil round, lens absorbed, in the middle of the thickened capsule a clear black pupil, vitreous clear, fundus normal, $V=\frac{20}{200}$ with + 10.0D, reads Sn. 2 with + 20.0D ; both distant and near vision being slightly interfered with by the central corneal scar. The exceeding smallness of the foreign body, weighing 0.000412 gm., being taken into account, it is very probable that considerable search through the vitreous would have been necessary to attract it with the Hirschberg magnetic probe. The large magnet drew it promptly from the vitreous body into the anterior chamber, necessitating a slight enlargement of the corneal wound, to extract it definitely.

The case proved satisfactory to both patient and surgeon.

Remarks.—Haab's electro-magnet, newest construction, is a powerful and most efficient instrument; connected with the constant street current of 120 volts, it extracted foreign bodies in my cases *cito et jucunde.* The first two cases were not touched by any instrument previous to removal; in the last case, a slight enlargement only was required, no probing, no fresh scleral incision, no introduction or passing of the magnet through the vitreous; exit and entrance through the same channel, with little, if any, additional injury to the eye. Having had some little experience in seven cases with Hirschberg's magnet, four of which were treated successfully, I, in common with my colleagues, am grateful for the improved hand magnet, and for Hirschberg's valuable advice as to its management in such cases; but the great superiority of Haab's instrument seems to me evident, being so much more powerful, and, in fact, never failing in its work; and to those who do not use Asmus's sideroscope it proves an excellent help for the detection of metallic intraocular foreign bodies, for Haab's magnet acts in a way as a sideroscope. Having made numerous experiments with very minute metallic fragments, introduced near the posterior pole of a hog's eye, I feel certain that the smallest foreign body which might penetrate into the human eye could be detected, in doubtful cases, by the Haab instrument, and extracted if present, in the vitreous. It was only after Prof. Haab had very kindly demonstrated its use to me, as well as that of the sidero-

scope, and after seeing it used on the living with excellent success at Prof. Fuchs's clinic, that I ordered it, being fully convinced that it is the strongest magnet to be had. Experiments made by me at Prof. Edelman's laboratory in Munich with Prof. Schloeser's instrument in February, 1896, were not satisfactory. Since then, however, I have heard from Prof. Edelman that this magnet has been considerably improved, and Prof. Hirschberg mentioned it lately as used in his clinic. It is very probable that it does good work; but I have pinned my faith to Haab's strong, beautiful instrument, so easy to handle, so prompt to act. No hospital, no oculist should be without it, in given cases using it in conjunction with Hirschberg's hand magnet. There can be no doubt that with such excellent aids, the future work in this important field of ophthalmic surgery will become more and more valuable and satisfactory.

CASE 4.—*Deep perforating injury to the eye by a piece of steel, successfully removed eight days after the accident, with nearly complete recovery of vision.*

W. Desmond, boiler-maker, injured his right eye October 20th, whilst striking a hard-tempered $1\frac{3}{8}''$ steel trap with a steel hammer. On examination a week later, I found very slight pericorneal injection; cornea intact, except at the margin just at the outer end of horizontal meridian, where a detached bit of conjunctiva indicated the point of impact of the foreign body. No perforation ascertainable. Iris normal, excepting a slight blood discoloration immediately behind point of injury; pupil round, responsive; anterior chamber normal. Isolated thread-like opacities on the anterior capsule; no signs of perforation on either capsule or lens, the latter perfectly clear. Slight diffuse, and small, joint-like, floating opacities in the vitreous; in the deeper and lower part, an ill-defined, lustreless, lumpy, movable opacity could be seen. Fundus visible, normal, although somewhat indistinct. Tension normal. $V = \frac{20}{200}$. No pain or sensitiveness on palpation. Atropin, bandage, rest.

The next day some pain, considerable bulbar injection, lachrymation, slight but distinct discoloration of iris; pupillary reaction still good. Vision and tension the same as the previous day. Through the fairly enlarged pupil a metallic body was not dis-

cernible, probably being hidden in the large vitreous opacity. The needle of Asmus's sideroscope distinctly deflected, but its previous unsteadiness made me loath to accept the verdict as final. The patient was then placed before the large magnet, the eye being approached within $\frac{1}{4}''$ from the pole when the current was closed. There was an instantaneous, severe pain, followed by a change in the pupil. Its lower edge, in spite of thorough atropinization, being sharply drawn towards the centre of the pupil, told the story of a foreign body being behind the lower segment of the iris; but still a foreign body was not yet visible. A second exposure brought a glistening small point through the iris behind the cornea, near the lower edge of the limbus.

Supposing that the foreign body was exceedingly small, judging from the minute point-like wound, I made the erroneous attempt to draw it towards the old wound; it followed promptly, but with it the iris in which the foreign body was thoroughly entangled. It was rudely drawn forward and upward, causing a slight hemorrhage into the anterior chamber and obscuring the foreign body from view. To avoid further injury to the iris and ciliary body, a small fold of iris was excised downward, and the magnet now readily brought the foreign body into the wound, and, after enlarging the latter slightly, the metallic bit fairly flew towards the magnet, adhering to its pole.

The foreign body, much to my surprise, was quite large, 2 *cgr.* in weight, 0.0045 long, 0.002 broad, 0.00975 thick, of an ugly hook-like shape. Only slight reaction followed, the blood was readily absorbed from the anterior chamber, but the traumatism of drawing forward the foreign body must have been severe, for on October 30th, three days after extraction, the hospital record reads:

Tension 1. No reflex from fundus; sensation of light.

Oct. 31*st.*—Could count figures.

Nov. 3*d.*—Refracting media clear. Fundus reflex more distinct; no details.

Nov. 5*th.*—Vision: R $\frac{20}{200}$.

Nov. 10*th.*—Slight pericorneal injection, pupil clear. Slight capsular opacity downward; lens clear; vitreous somewhat opaque. Fundus details dimly visible. V $= \frac{20}{30}$.

Two weeks later the patient returned to work, eye none the worse for initial and operative traumatisms, and with, what is most gratifying, no injury to the lens, the foreign body having

entered into the depth of the eye and leaving it again through the pericorneal space. Except for the small coloboma downward, the eye was free from irritation, faced light bravely, had good vision, with only a slight marginal contraction of the field, corresponding to a slight peripheric detachment near the ciliary part of the retina, at the point of entrance of the foreign body.

Tension normal.

V : R = $\frac{20}{30}$, with C + 2.0 60° temp. ⊃ C − 1.0 30° nasal.

V : L = $\frac{20}{20}$. No astigmatism.

ARE OUR PRESENT IDEAS ABOUT THE MECHANISM OF THE EYE-MOVEMENTS CORRECT?

A CONTRIBUTION TO THE MECHANICS OF THE EYE.

By CARL WEILAND, M.D., Philadelphia.

(*With five figures in the text.*)

THE importance of the axial adjustment of the eyes is well recognized by every ophthalmologist who carefully examines each patient as to the ease or difficulty with which both eyes are directed to the same object, and who often experiences much more trouble in treating the axial than the focal adjustment of these organs. As our ideas about the axial adjustment of the eyes must be founded to a great extent on the mechanism of movement for each eye, it would seem necessary first to have accurate and exact views about this mechanism. Now if we look through all the modern text-books of physiology and ophthalmology we find pretty nearly the same statements in regard to the mechanics of the eye-movements. Most authors give only approximative statements. They say that the eye moves out or in around a vertical axis by the rectus externus and internus. They further state that the superior and the inferior rectus muscles have one common axis of rotation, lying in the horizontal plane, and making an angle of about 70° with the line of fixation in the primary position of the eye, and further that the common axis of rotation of the oblique muscles also lies in the horizontal plane, cutting the former line of regard at an angle of 35°. But when describing the action of the latter four muscles they all concur in the state-

ment that each of these muscles moves the eye also laterally, that is, either in or out. Now these statements are incompatible. These four muscles cannot have their two axes in the *horizontal* plane and at the same time produce lateral movements or a rotation around the *vertical* axis.

To make this point quite plain, let us recall for a moment an important theorem of kinematics, which will be made frequent use of hereafter. This theorem,[1] with special reference to the eye, may be expressed thus: If the eye is to rotate simultaneously around two or three axes which are at right angles to each other, and which all go through one fixed point, the centre of rotation, we can find the resulting rotation in amount and direction by the following construction. From the centre of rotation lay down on each axis a line corresponding in units (inches, centimetres, etc.) to the number of degrees of rotation around that axis, but put it down on the axis in such direction that, if you look from the end of the line *towards* the centre, the rotation will occur like that of a hand on a clock. Then construct the parallelogram or parallelopipedon of the two or three lines, and the resulting diagonal will give the new axis of rotation and also by its length in units the amount of rotation around it.

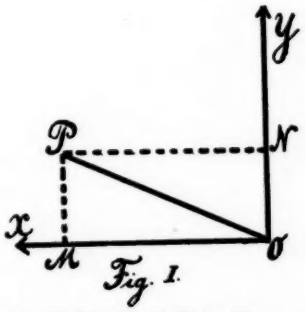


Fig. 1.

For example, let O X and O Y in Fig. 1 be the two axes of rotation, and let O N and O M correspond in units to the degrees of rotation around the respective axes (O N = 3° and O M = 4°). Now construct the parallelogram O M P N,

[1] Conf. Delaunay's *Analytical Mechanics*, § 58.

and the diagonal O P gives the new axis of rotation and the amount (O P = 5°). In a similar way if we have three axes of rotation, at right angles to each other, around which the eye is to rotate simultaneously, and O M, O N, and O R of Fig. 3 signify the degrees of rotation around their respective axes, then, by constructing the parallelopipedon O M K N G S H R, we obtain the diagonal O S as the resulting axis and amount of rotation. So if the rotation around O X was O M = 4°, that around axis O Y was O N = 3°, and that around O Z was O R = 2°, then the equivalent rotation around axis O S would be $= \sqrt{4^2 + 3^2 + 2^2} = 5.38°$.

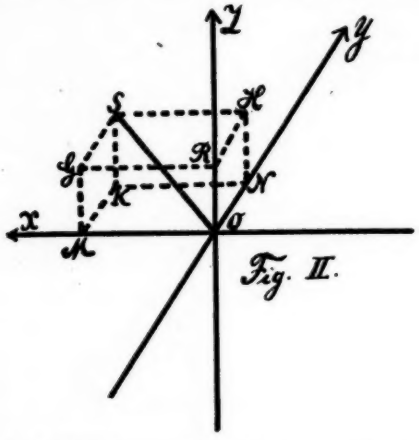


Fig. II.

While the latter theorem teaches us to find the resultant action of three rotations around different axes, it also allows us to decompose any rotation around any oblique axis, going through the centre of rotation, into three different ones around three other axes, going through the same centre of rotation. Thus we may decompose the rotation around the oblique axis S O into N O, M O, and R O along the three axes O X, O Y, and O Z at right angles to each other, so that, if the rotation of the eye around O S amounted to 5.38°, we could get the same result by first rotating the eye around O X by M O = 4°, then around O Y by O N = 3°, and finally around axis O Z by O R = 2°. If there are

simultaneous rotations around two or more oblique axes, we can decompose each rotation into three rotations around the three stationary axes, and then by adding all the units along each axis obtain thus the final rotations around the X, Y, and Z axes, which are equivalent to all the rotations around the oblique axes.

Such a rectangular system of co-ordinates was applied to the human eye first by Fick in 1853, and later by Ruete in 1857. They used, however, the centre of the eye for the origin O of the co-ordinates, while later students of this subject took as such the point of rotation, which lies a little more than one millimetre behind the centre of the globe, and has been shown to be quite constant during the eye-movements, at least for normal eyes. It will be taken also as the point of reference in these lines. With Fick I shall also call that line, which in the horizontal plane joins the two rotation-centres of the eyes in the primary position, the X axis. I shall further denominate as the Y axis the line which horizontally runs from behind forward, practically coinciding with the optic axis of the eye, and I finally take for the Z axis the line at right angles to the X and Y axes, just introduced. With Fick I further determine that the positive direction of the X axis shall run outward, the positive direction of the Y axis from the centre backward, and the positive direction of the Z axis from the centre upwards. It has been stated above that the rotation around these three axes should occur in such a manner that, if from the endpoint of the line denoting the units of rotation we looked to the centre, the rotation should proceed like that of a hand on a clock. This notation is quite opposite to that usually employed by the authors on analytical mechanics, but as Fick applies it thus to the eyes, and others have followed him, I shall adhere to it also.

From this purely analytical digression it must be clear that rotation around any horizontal axis can never be decomposed in such a manner that a partial rotation around the vertical axis does result, and that, therefore, if the authors are correct in stating the axes of sup. and inf. rect. and of sup. and inf. obl. to be horizontal, no lateral move-

ment of the eye around the Z axis can occur. Here, therefore, is a discrepancy between their statements, which, though quite glaring, is usually not referred to by the writers. The current views besides are all based on Ruete's measurements forty years ago, who made his observations on no more than four bodies—a number certainly not sufficient to establish reliable averages. This was clearly seen by Volkmann (*Berichte über die Verhandlungen der Kgl. Sächs Gesellsch. der Wissenschaften*, Leipzig, i., 1869), who therefore endeavored to obtain new values from at least 30 observations. These were made with greater care and better instruments, and for these reasons deserve much greater confidence than those of Ruete; which is admitted also by Aubert in *Graefe and Saemisch*, ii. Bd., 1876, where he calls them the most reliable observations made up to that time. Now there can be no doubt, that even at the present time we possess no other data as reliable as those of Volkmann with reference to this subject, and yet none of the present text-books make any mention of these valuable researches. This is probably due to the circumstance that Volkmann found a separate axis for each of the six muscles, which makes the problem of the eye-movements a pretty complex one. Volkmann himself regarded the question rather insoluble, as is evinced by his own words, when he says (*loc. cit.*, p. 65): "It would be a problem extremely difficult, and at the present time well-nigh insoluble, to show exactly how a certain movement of the eye may take place as the resultant of six components." It is the purpose of the following lines to make use of Volkmann's researches, and to show that the problem is not so insoluble as he thought. I shall attempt to solve the question by applying the kinematic theorem before mentioned, so that we may see how our present views about the ocular movements have to be modified.

According, then, to Volkmann's careful measurements each of the six muscles of the eye has its own axis of rotation, so that they are not arranged in three pairs, as is taught at the present. The movements produced by each muscle are as follows:

Rect. Ext.	moves	eyeball	out, up ;	rotates	upper	cornea inward.
Rect. Int.	"	"	in, up ;	"	"	" outward.
Rect. Sup.	"	"	up, in ;	"	"	" inward.
Rect. Inf.	"	"	down, in ;	"	"	" outward.
Obl. Sup.	"	"	down, out ;	"	"	" inward.
Obl. Inf.	"	"	up, *in ;*	"	"	" outward.

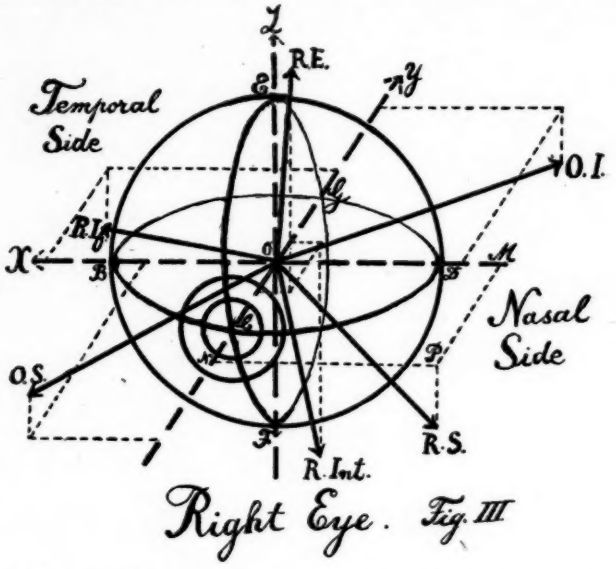
From this table we see at once that there are three muscles which Volkmann found to work quite differently from the way usually stated. The first is the rect. ext., which moves the eye not only out but also up, and rotates the upper part of the vertical meridian of the cornea nasally. The second muscle is the rect. int., which, aside from the well-known inward movement, produces also an upward movement and temporal torsion; whilst the third is the obl. inf., which moves the eye *in* but not *out*, as is usually supposed.

Thus far, to use a chemical expression, only a *qualitative* analysis has been given; but Volkmann's researches allow us to give also a *quantitative* analysis. According to his determinations the axes of the six muscles make the following angles with the positive directions of the X, Y, and Z axes.

Muscle.	Angle with X Axis.	Angle with Y Axis.	Angle with Z Axis.
Rect. Ext.....	90° 52′	91° 20′	1° 25′
Rect. Int.....	90° 41′	89° 15′	178° 59′
Rect. Sup.....	150° 5′	113° 47′	107° 5′
Rect. Inf.....	31° 53′	66°	108° 34′
Obl. Sup... ..	53° 48′	146° 42′	79° 15′
Obl. Inf.....	129° 13′	39° 54′	96° 14′

Fig. III. will make this clearer. Here O represents the centre of rotation of the right eye, which is supposed to face the reader and to be in the primary position, B E D F is a vertical section of the eye in the X Z plane, B C D G is the horizontal section in the X Y plane, and E C F G a vertical section in the Y Z plane. The three stationary axes are O X, O Y, O Z, these being their positive directions. The six axes of rotation are marked for each muscle, and, to show how the rotation around each axis may be decomposed into three different rotations around the X, Y, and

Z axes, the same length is laid down on each axis and each projected on the three stationary axes, according to Fig. II. If, for example, O R. S. represents by its length the amount of rotation around the axis of the rect. sup., let us say 100°, then, by analyzing this movement according to our theorem, we find O M as the amount of rotation around the X axis, that is, upward (= 86.67°), O N as the rotation around the



Right Eye. Fig. III

Y axis or medial torsion (= 40.32°), and P R. S. as the rotation around the Z axis or inward (= 29.37°). This construction is made according to the theorem before given, and the numbers are obtained by the formula $X = R \cos \alpha$, $Y = R \cos \beta$, and $Z = R \cos \gamma$, where α, β, γ express the angles of each muscle axis with the X, Y, and Z axes respectively. R represents the amount of rotation in degrees around the axis of the respective muscle (= 100), and X, Y, and Z express the amount of rotation around the three stationary axes, which together are equivalent to the rotation R around the oblique axis. In this way the following table was calculated:

TABLE EXPRESSING THE AMOUNT OF ROTATION OF EACH MUSCLE AROUND THE THREE STATIONARY AXES, IF THE ROTATION AROUND THE AXIS OF EACH MUSCLE WOULD AMOUNT TO 100°:

Rect. Ext.	α	Outward, 99.96° (a)	Upward, 1.51° (b)	Med.	Torsion,	2.32° (c)
Rect. Int.	β	Inward, 99.98° (d)	Upward, 1.42° (e)	Lat.	"	1.31° (f)
Rect. Sup.	γ	Upward, 86.67° (g)	Inward, 29.37° (h)	Med.	"	40.32° (k)
Rect. Inf.	δ	Downw'd, 84.91° (m)	Inward, 31.84° (n)	Lat.	"	40.67° (p)
Obl. Sup.	ε	Downw'd, 59.06° (q)	Outward, 18.65° (r)	Med.	"	83.58° (s)
Obl. Inf.	ζ	Upward, 63.22° (t)	Inward, 10.85° (v)	Lat.	"	76.71° (w)

Of course, 100° are too much for the rotation of the eye around the axis of each muscle, as the respective muscles cannot move the eye to such an extent; and it is for this reason that the factors, α, β, γ, δ, ε, ζ, have been added to each muscle in the table, in order to indicate that we may multiply each rotation with a certain fraction to get smaller values than one hundred. If, for example, we had a rotation of only 10° around the axis of the rect. sup., then the factor γ would have to be equal to $\frac{10}{100}$ or $\frac{1}{10}$, and we find that the three component movements would be: upward, 8.66°; inward, 2.93°; and med. torsion, 4.03°, which is obtained by multiplying each number in the horizontal line for the rect. sup. by $\frac{1}{10}$. In this manner we are enabled to introduce *quantitative* determinations into the consideration of the movements of the eyeball, and thus do away with many vague statements, one of which, generally, is as follows: The rect. inf. produces movement downward, inward, and lateral torsion, while the obl. sup. moves the eye down and out, and produces medial torsion. With such only qualitative expressions it is easy to assert that both these muscles together produced a movement downward, because the other two rotations counteracted each other; but if we use real numbers, like those derived from Volkmann's careful measurements, we find that it is impossible for the inf. rect. and sup. obl. together to give rise to a simple downward movement.

I shall show now how we may proceed to obtain a certain movement of the eye by the combined action of different muscles. All these movements, of course, must be in agree-

ment with the law of Listing, which, at least for movements with parallel eyes, has been shown to be quite correct. This law may be expressed thus: If the line of fixation is brought from the primary position into any other position, there is no rotation around the stationary Y axis or the antero-posterior axis of the eye; but the globe rotates around an axis, which is perpendicular to the first and the last position of the line of fixation. It has been demonstrated, for example, by the actual experiments of Helmholtz, Hering, Volkmann and others, that the eye may turn from its primary position directly up, down, out, or in without the least torsion. Let us first confine ourselves to a pure abduction and ask: What are the muscles involved in simple abduction? Formerly the answer usually was, that it was only the rect. ext. which moved the eye outward.

Now many authors, like Fuchs, Duane,[1] and others, teach that the two oblique muscles assist in abduction. But, aside from the circumstance that, according to Volkmann's observations, the obl. inf. does not move the eye *out* but *in*, it must be said that they do not lay stress on the *necessity* of their co-operation. With them the rect. ext. alone *can* produce a simple abduction, but this is not possible according to the views expressed here. Other muscles *must* co-operate, not only to keep the eye steady in its path, but also to prevent the elevation and medial torsion incident to the action of the rect. ext. I shall now try to prove that it is possible to abduct the eye to the same degree in innumerable ways. In order to prove this I shall assume, first, that *all* the muscles of the eye are acting to produce a certain amount of abduction. Then it is evident, from Listing's law, that the combined action of all the muscles must be such that neither elevation and depression nor torsion takes place, or, in the language of analytical geometry, that the algebraic sum of the projections of all the muscle-lines on the X axis, and also on the Y axis, must be equal to zero. These two necessary conditions are now expressed in the following two equations:

$$\text{I.} \quad \alpha b + \beta e + \gamma g - \delta m - \varepsilon q + \zeta t = 0$$

$$\text{II.} \quad \alpha c - \beta f + \gamma k - \delta p + \varepsilon s - \zeta w = 0$$

[1] *Motor Anomalies of the Eye*, p. 9, A. Duane.

Here $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta$ are the unknown factors, mentioned before, with which we have to multiply the numerical values for each muscle in order to get the desired result. The values for a, b, c, etc., have been given in a former table. The final abduction then is the algebraic sum of the projections of all the muscle-lines on the Z axis or

$$\text{Abduction} = \alpha a - \beta d - \gamma h - \delta n + \varepsilon r - \zeta v$$

If we now divide equation I. and II. by α, which is allowed, as only the relation of $\beta, \gamma, \delta, \varepsilon, \zeta$ to α is wanted, we see that we have two equations with five unknown quantities, which in general must give a countless number of solutions; that is, there are, as far as the algebraic possibilities are concerned, a countless number of ways in which the eye may be abducted in accordance with the law of Listing. But the number of solutions will be restricted at once by the consideration that in accordance with their meaning only positive values of $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta$ can be admitted.

We will now ask: What is the simplest way of producing abduction? By our exposition it is clear that no *single* muscle, not even the rect. ext., can produce simple abduction. But can it be done by the combined action of two muscles? By combining the six unknown factors $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta$ in the fifteen pairs possible, and putting the other factors in equation I. and II. equal to zero, we obtain each time two equations with only one unknown quantity. If, for example, $\beta, \gamma, \zeta, \varepsilon$ are equal to zero, so that of all the muscles only the rect. ext. and the rect. inf. are acting, then the two equations are reduced to: $\delta m = \alpha b$ and $\delta p = \alpha c$ or $\delta = \alpha \frac{b}{m}$ and $\delta = \alpha \frac{c}{p}$. But as $\frac{b}{m} = \frac{1.51}{84.91}$ is quite different from $\frac{c}{p} = \frac{2.32}{40.67}$, we see that these two equations are not compatible with each other, and that therefore these two muscles cannot produce simple abduction. In the same manner we find by actual calculation, that none of the other fourteen pairs of equation can be satisfied with the values a, b, c, etc., that have been found by observation. It follows, then, *that it is impossible that two muscles together should move the eye only out-*

ward, and now the question arises: Can *three* muscles abduct the eye in accordance with the law of Listing?

To simplify matters, let us first suppose that the rect. ext. always entered into the combination of the three muscles to produce simple abduction, then we have to combine with α any other two of the factors β, γ, δ, ε, ζ and each time to put the remaining three factors equal to zero. Thus we find that only three combinations are possible. These are

1. Rect. Ext., Rect. Inf., and Obl. Inf. (α, δ, ζ).
2. Rect. Ext., Rect. Sup., and Rect. Inf. (α, γ, δ).
3. Rect. Ext., Rect. Int., and Rect. Inf. (α, β, δ).

The remaining seven of the ten possible combinations are to be rejected, because they give negative values for the respective factors. To show the manner in which this result was obtained let us take the first case. Here we must put $\beta, \gamma, \varepsilon = 0$ in equation I. and II. and thus we find:

$$\alpha b - \delta m + \zeta t = 0$$
$$\alpha c - \delta p - \zeta w = 0$$

From these two equations it follows according to simple algebra that

$$\zeta = \alpha \frac{(cm-bp)}{tp+mw} \text{ and } \delta = \alpha \frac{(bw+ct)}{tp+mw}$$

If we give to α the value 0.5, which means, according to our former table, that the rect. ext. alone produces abduction (but not simple) of 49.98°, then we find by introducing the values for c, m, etc., that $\zeta = 0.007462$ and $\delta = 0.014445$.

By multiplying now the respective muscular values with these factors we find the result given in the table below.

Muscle.	Factor.	Out.	In.	Up.	Down.	Med. Tors.	Lat. Tors.
Rect. Ext..	$\alpha = 0.5$	49.98°	.....	0.755°	.....	1.16°	.....
Rect. Inf..	$\delta = 0.014445$	.....	0.460°	.....	1.2265°	.....	0.5875°
Obl. Inf....	$\zeta = 0.007462$	.....	0.0805°	0.4715°	.....	.....	0.5725°
		49.98°	0.5405°	1.2265°	1.2265°	1.16°	1.1600°

This table shows that the elevating action is exactly equal to the depression, and that the medial torsion is counteracted by the lateral torsion. The final abduction therefore is $49.98 - 0.54 = 49.44°$; that is, only $\frac{1}{2}$ degree is taken away from the full abductive action of the rect. ext. This is quite different in the other two possible combinations. In the third combination, where rect. ext., rect. int., and rect. inf. act, we obtain with the same exertion of the rect. ext. as in the first example ($= 48.98°$; $\alpha = 0.5$) a simple abduction of only 9.37°, and in the second case, where rect. ext., rect. sup., and rect. inf. are at work, we get an abduction of only 8.29°. It is evident, therefore, that a certain degree of simple abduction can be brought about by rect. ext., rect. inf., and obl. inf. much more economically than by the other two combinations. At the same time it must be remembered that the same final position of abduction may be brought about in very different ways, according as it is due to different impulses; so that the first combination may be used for parallel movements of both eyes, while the third one may be employed for looking at a point near by, where parallel and convergent movements are used simultaneously.

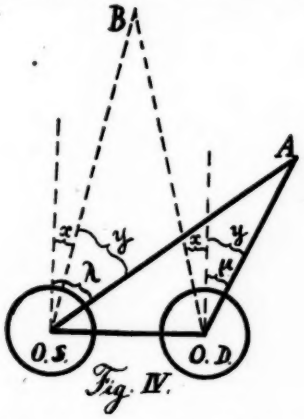


Fig. IV.

Fig. IV. is intended to make this clearer. O. S. and O. D. represent the centres of rotation for both eyes, A is the point looked at and λ and μ are the angles, which the line

of fixation of each eye in the final position makes with the same line in the primary position. Now it has been made very probable, by the researches of Hering and others, that for a point near by, but not in the median line, both eyes are moved by two equal impulses, one of convergence and one of associated lateral movement. If the equal impulse to convergence is called x, and the other impulse is called y, we must have according to the diagram $x + y = \lambda$ and $y - x = \mu$, which gives $x = \frac{\lambda - \mu}{2}$ and $y = \frac{\lambda + \mu}{2}$. Thus we may consider the final relative position of the eyes brought about by an impulse of convergence $x = \frac{\lambda - \mu}{2}$ towards B and one of associated lateral movement $y = \frac{\lambda + \mu}{2}$. Now we may calculate the result of the combined action of rect. ext., rect. int., and rect. inf. as follows:

Muscle.	Factor.	Out.	In.	Up.	Down.	Med. Tor	Lat. Tor.
Rect. Ext.	$\alpha = 0.5$	49.98°	.....	0.755°	.....	1.16°	.....
Rect. Int..	$\beta = 0.4011$	.....	40.1085°	0.5695°	.....	.....	0.525°
Rect. Inf..	$\delta = 0.0156$	.....	0.4965	.....	1.3245	.....	0.635°
		49.98°	40.605°	1.3245°	1.3245°	1.16°	1.160°

The right eye therefore may be brought into the final position of abduction = 9.4° by an impulse to associated parallel movement of about 50° and an impulse of convergence of about 40°. Here attention must be called to the point that in these three combinations, just discussed, the three muscles are bound together by one definite relation, or, in other words, if a certain degree of abduction is to be brought about by any of these three sets of muscles, then there is only *one* way, in which in each case the three muscles can do so. Suppose we wanted to produce an abduction of the eye of 20° by the first set, then we only need divide 20 by 49.44 and multiply α, δ, and ζ by this ratio to obtain in a definite way the relative work of each muscle.

This is not so if abduction is the final effort of four or more muscles. If we first investigate the case, where the

eye is moved out by four muscles, the rect. ext. always being included, we find from equation I. and II., in the way indicated before, that there are six combinations of four muscles, each of which will produce simple abduction as demanded by the law of Listing. These are

1. Rect. Ext., Rect. Inf., Obl. Sup., Obl. Inf. (α, δ, ε, ζ).
2. Rect. Ext., Rect. Sup., Rect. Inf., Obl. Inf. (α, γ, δ, ζ).
3. Rect. Ext., Rect. Sup., Rect. Inf., Obl. Sup. (α, γ, δ, ε).
4. Rect. Ext., Rect. Int., Rect. Inf., Obl. Inf. (α, β, δ, ζ).
5. Rect. Ext., Rect. Int., Rect. Inf., Obl. Sup. (α, β, δ, ε).
6. Rect. Ext., Rect. Int., Rect. Sup., Obl. Inf. (α, β, γ, ζ).

To show how different the result of these combinations is from that in the previous case of three muscles, we will take the second combination. Here we find as the final conditions ($\alpha = 1$), resulting from equation I. and II. $\zeta < 0.01523$ and $\zeta < 0.01492$, that is any positive value for ζ smaller than 0.01492 will suffice; whilst formerly we always obtained from a definite value of α also definite values for the other factors. It follows, therefore, that different degrees of innervation of the special muscles are possible, though the innervation of the rect. ext. remain the same. If, for example, in the last combination ζ is made equal to 0.01, we obtain (after again reducing α to 0.5) an outward rotation of the eye equal to 35.89°, because 14.09° have been taken away from the action of the rect. ext. (= 49.98°) by the inward movements of rect. sup., rect. inf., and obl. inf. If we took, however, for ζ another value, *e.g.*, 0.005, we of course would get a different final abduction, but it would still be compatible with the same action of rect. ext. ($\alpha = 0.5$). Similarly we find in the sixth combination as the two final conditions that have to be fulfilled: $\delta > 0.02478$ and $\delta < 1.38784$ ($\alpha = 1$). Taking now for δ the value 0.1, we find, after reducing α, β, γ, and δ to half their values, an abduction of only 9.32°, because the rect. int. takes 38.07° and rect. sup. and rect. inf. take together 5.17° away by their impulse to adduction. Different degrees of abduction are obtained by taking a different value for δ, while the value for α is left equal to 0.5.

Now as to abduction produced by five muscles, the rect.

ext. always entering into the problem. From equation I. and II. again follows that there are four different groups of muscles, which may produce simple abduction. They are:

1. Rect. Ext., Rect. Sup., Rect. Inf., Obl. Sup., and Obl. Inf.
2. Rect. Ext., Rect. Int., Rect. Inf., Obl. Sup., and Obl. Inf.
3. Rect. Ext., Rect. Int., Rect. Sup., Rect. Inf., and Obl. Inf.
4. Rect. Ext., Rect. Int., Rect. Sup., Rect. Inf., and Obl. Sup.

To demonstrate that in each set there is now a still greater number of possible impulses, we will take the third combination. Here equation I. and II. furnish the following conditions:

$$\delta > 0.031203 - 0.154\zeta$$
$$\delta < 1.38418 - 90.8127\zeta \text{ and } \zeta < 0.014923$$

It is therefore possible to give, at least within certain limits, innumerable values to δ and ζ. As an example, let us take (α being 1) $\zeta = 0.013$; then we get $\delta > 0.02919$ and $\delta < 0.20362$. Let δ be equal to 0.04. From these two assumed values we find definite values for β and γ, and thus obtain an abduction as given below (α=0.5, etc).

Muscle.	Out.	In.	Up.	Down.	Med. Torsion.	Lat. Torsion.
Rect. Ext...	49.98°	.....	0.755°	.....	1.16°	.....
Rect. Int...	.....	4.850°	0.068°	.....	.....	0.064°
Rect. Sup..	.....	0.157°	0.464°	.....	0.215°	.....
Rect. Inf...	.....	0.636°	.....	1.698°	.....	0.813°
Obl. Inf....	.....	0.070°	0.411°	.....	.....	0.498°
	49.98°	5.713°	1.698°	1.698°	1.375°	1.375°

In this case, then, there results an abduction of 44.267°, which is obtained by the simultaneous action of all the muscles innervated by the sixth and third nerves. Of course any smaller number, *e.g.*, 4.4°, may be obtained by changing all the factors (α included); that is, in our example, by multiplying them by $\frac{4.4}{44.2}$ or about $\frac{1}{10}$; but it must not be forgotten that the same result may be obtained by leaving $\alpha = 0.5$, and changing only the other factors. This

complexity is still further increased, if all the six muscles are now contracting to produce simple abduction, for now *three* muscles may vary in their degrees of exertion, whilst the rect. ext. does the same work as before. With six muscles the last condition is $\zeta < 1.055\,\varepsilon + 0.01492$; from which it is apparent that ε is quite arbitrary. The values for ζ and δ are also arbitrary, but have to be within certain limits. If we give to ε the value of 0.02055 and make $\zeta = 0.0325$ and $\delta = 0.04$, then we get $\gamma = 0.0087$ and $\beta = 0.2041$, while $\alpha = 1$. If all these values are reduced one half we obtain a pure abduction of 39.028°, because 11.143° are taken off from the abductive action of rect. ext. and obl. sup. (49.98° + 0.191°) by the adductive components of all the other muscles.

We now come to the question whether it be possible to produce simple abduction according to Listing's law even without the aid of the rect. ext. We cannot enter fully into this problem; suffice it to state that there are many solutions. Of course there cannot be produced as much abduction as if the rect. ext. acted fully, because of all the other eye-muscles only the obl. sup. has a component of abduction. Let us take as an example the combination of rect. inf. and the two oblique muscles. If $\varepsilon = 1$, $\zeta = 1.0455$, and $\delta = 0.0829$, we obtain an abduction of 4.68°, these being due to an abductive impulse of the obl. sup. = 18.65°, and a counteracting adductive impulse of rect. inf. and obl. inf. = 13.97°. As this apparently small result is brought about by extreme exertions of obl. sup. and rect. inf., it is evident that much abduction cannot be obtained in this case, where rect. ext., rect. inf., and rect. sup. are supposed to be paralyzed, or at least to be inactive.

The foregoing exposition shows that the final position of an eye in abduction may be the result of very many different impulses. We have found that abduction may be brought about by fourteen different groups of muscles, into each of which the rect. ext. enters; and that there are a few more groups which can produce moderate abduction even without the rect. ext. And as further in almost all these groups different innervations of the different muscles are possible,

we finally come to the conclusion that, at least for moderate degrees of abduction, there is a countless number of ways to produce it.

What has just been said about abduction applies equally to adduction. Here the two primary equations are

$$\text{III. } \alpha b + \beta e + \gamma g - \delta m - \varepsilon q + \zeta t = o$$
$$\text{IV. } \alpha c - \beta f + \gamma k - \delta p + \varepsilon s - \zeta w = o$$

which again express nothing more than that, in accordance with Listing's law, there shall be neither elevation, depression, nor torsion. Space is wanting to discuss these equations as fully as those about abduction. We will only adduce a few examples. If $\alpha = o$, that is, if the rect. ext. is at rest and $\beta = 0.5$, $\gamma = 0.2014$, $\delta = 0.205$, $\varepsilon = 0.015$, and $\zeta = 0.005$, we get an adductive impulse of 62.48° and an abductive impulse of 0.28°, *i.e.*, a final adduction of 62.20°, while no rotation around the X or Y axis occurs. If the rect. ext. shall act also, we get, making $\beta = 0.5$, $\alpha = 0.005$, $\gamma = 0.2076$, $\delta = 0.2132$, $\varepsilon = 0.015$, and $\zeta = 0.005$, an adductive impulse of 62.10°, and an abductive impulse of 0.78°, or a final adduction = 62.32°. Adduction is also possible if the rect. int. is paralyzed or at least inactive. I shall give here only two solutions. One is obtained by making α, β, and $\zeta = o$, when the combined action of rect. sup. ($\gamma = 0.4688$), rect. inf. ($\delta = 0.4755$), and obl. sup. ($\varepsilon = 0.005$) gives a final adduction = 28.81°. If only α and $\beta = o$, and $\gamma = 0.408$, $\delta = 0.4312$, $\varepsilon = 0.1$, $\zeta = 0.1$, the result is a simple adduction of 24.95°. This shows that considerable adduction is possible without the action of the rect. int.

It will be clear now how simple elevation, depression, and torsion may be treated and analyzed in the same manner, but space forbids to enter into this problem here. However, so much must be stated that there is also the same great number of possible solutions.

Thus far we have discussed only abduction, adduction, elevation, depression, and torsion. But how is it if the eye does not look directly up and down, or to the left and right? Suppose the right eye in the primary position looked at C (Fig. V.) and later looked up and out at A, then, according

to the law of Listing, the eye would rotate around an axis perpendicular to both the line of fixation in the primary position and to that in the final position, or, which is the same, the new axis of rotation would lie in the X Z plane of the eye and could be transferred parallel to itself to the opposite wall as line D C at right angles to the line C A. Now if the angle that line C A makes with the vertical be called ϑ, then it follows from the theorem before given, that the rotation D C around the oblique axis can be decomposed into a simple elevation = M C = D C cos ϑ, and a simple abduction N C = D C sin ϑ. With these two rotations we can

Fig. V.

now proceed as before; we find the muscles and their individual contributions for the elevation (α, β, γ, δ, ε, ζ) and then the same for the abduction (α', β', γ', δ', ε', ζ'), and at last by addition get the final contributions of each muscle expressed by the factors $\alpha + \alpha'$, $\beta + \beta'$, $\gamma + \gamma'$, $\delta + \delta'$, $\varepsilon + \varepsilon'$, $\zeta + \zeta'$. Thus we would be enabled to state by which muscles and by what relative exertion of each muscle the eye was finally brought into the desired position. Of course again there would be a very great number of possible combinations and solutions.

Now as to the question as to which combination is used in a special case, I must confess that as yet a complete answer seems impossible. One might reasonably suppose that that group of muscles was employed which required the least exertion to bring about the result. But there is no doubt that the underlying conditions, namely, the position of the axis and the strength and innervation of each muscle, vary considerably in different individuals; so that what is economical and easy in the one may not be so in the other. And again, what is difficult to-day may be comparatively easy for the eye some time later, because improve-

ment in health and confinement to special eye-work may have changed conditions. But a further discussion would lead us right into the battle-ground of the nativistic and empiric theories of sight, which lies outside of the domain of this paper.

Simplex sigillum veri is an old saying; but that it is by no means always correct, anybody must admit who has followed the recent development of physiology. There always seems to be a phase in the growth of human science, when it appears to be possible to cover a certain subject by a few simple laws; until science advances and finds that these simple laws are only rough deductions and statements from a few limited observations, statements which indeed are often useful and sometimes even necessary for the beginner, but which do not represent the whole truth. The present paper shows the same development for the physiology of the eye-movements. To draw all the inferences from this new exposition, *e.g.*, with reference to operative procedures, is of course impossible in the present paper, but anybody who has read these lines will admit that the movements of the eyeball are a problem much more complex than it would appear from the present text-books. Only by the introduction of numerical values into our geometrical considerations can there be evolved a real science of the movements of the human eyes.

A CASE OF EXCESSIVE MYOPIA TREATED BY EXTRACTION OF THE TRANSPARENT LENS.

By WILLIAM HOLLAND WILMER, M.D., Washington, D.C.

AMONG the sufferers from very high degrees of myopia, there seems to be a general complaint of the inadequacy of glasses, and a corresponding willingness to assume almost any risk in the hope of obtaining better and more comfortable sight. I am often asked by excessively myopic patients (many of whom are totally ignorant of the possibility of removing the clear lens) if there is not *some* operation that could be performed to give them relief.

At the earnest solicitation of one of these sufferers, I performed the operation of extracting the transparent lens. I merely report this case as briefly as possible without referring at all to the literature upon the subject.

Miss S——, aged thirty-five, a teacher by profession, consulted me first on March 10, 1897. A German by birth and most intelligent, she was well acquainted with the literature of the operation, and, with full knowledge of its dangers, she was determined to have it performed.

Javal's ophthalmometer showed in each eye an astigmatism of 2.75 D with the rule, the axis of the correcting cylinder being at 10° in the right eye and at 180° in the left eye. The refraction was: REV $= \frac{1}{20}$; with S — 25.0 D ⊃ c — 2.50 D axis 10° $= \frac{20}{100}$ LEV $= \frac{3}{20}$; with S — 18.0 D ⊃ c — 2.50 D axis 180° $= \frac{20}{50}$ A mydriatic did not change the refraction except in the left eye, where there was 1.0 D less of myopia. The strongest glass tolerated was S — 14.0 D ⊃ c — 2.0 D axis 10° for the right eye, and S — 12. D ⊃ c — 2.0 D axis 180° for the left eye. In each eye, there was a large posterior staphyloma, with additional areas of choroidal

atrophy beyond the macular region, which, however, was free. There were no vitreous opacities.

Having again laid great stress upon the risks of the procedure, I promised Miss S—— to operate upon the right eye after the close of her school session.

June 22.—The pupil was thoroughly dilated with atropia, a 4% solution of cocaine used to anæsthetize the cornea, and the lens quite freely needled with Bowman's needle, great care being taken not to wound the vitreous. The needling was followed by ice applications and the instillation of a 1% solution of atropia three times a day. Neither pain nor inflammatory reaction ensued. There was only moderate swelling of the lens-substance.

June 27 (the fifth day after the needling).—The opaque lens was extracted without iridectomy. The incision was made above in the clear cornea about 2 *mm* within the sclero-corneal margin. Upon completing the section, the soft lens presented itself through the opening in the anterior capsule made by the previous needling, thus rendering the use of the cystotome inexpedient. No vitreous was lost, and the iris replaced itself without assistance. To prevent a prolapse of the iris, several drops of a solution of eserine, $\frac{1}{10}$%, and cocaine, 10%, were instilled, and both eyes bandaged. The patient was kept in bed, and on soft diet. A cathartic had been administered the night before the operation.

June 28.—The bandage was removed, the eye washed with boric-acid solution, and both eyes were re-bandaged. There was no pain, the iris was in place, and the wound closed.

June 29.—Bandage removed, condition of the eye satisfactory, eye washed with boric-acid solution, and a drop of a 3% solution of atropia instilled. Order given for patient to sit up out of bed the next day. Eyes re-bandaged. The eye was dressed daily, washed with boric-acid solution, and atropia instilled. On the fifth day after the operation, the left eye was not re-bandaged, and on the eighth day, the bandage was left off the right eye and a 1% solution of atropia instilled three times a day. The healing was smooth and uneventful.

July 13.—An opaque capsule, which was not at all dense, covered the pupil. The field was complete and the eye free from all irritation. A discission was made with Knapp's needle-knife, atropia used, and the right eye bandaged. There was practically no irritation following this procedure, and on the third day, the bandage was left off.

August 7.—There was still a slight bit of capsule covering the nasal portion of the pupil. The eye was free from pain. V = $\frac{10}{200}$, without a glass. The patient was allowed to leave the city for the summer.

September 4.—With Knapp's needle-knife, a free discission was made of the remaining portion of the capsule, atropia used, and the eye bandaged. The eye was dressed daily, and the bandage left off on the fourth day. Following this discission there was a slight iritis.

November 20.—The pupil was round, absolutely clear, and reacted perfectly. No irritation, no sensitiveness to light. Ophthalmometer showed an astigmatism of 1.25 D with the rule. REV = $\frac{20}{200}$; with S — 2.50 D ⊃ c — 1.0 D axis 180° = $\frac{20}{40}$—. Could read ordinary newspaper print with great ease at 10½ inches without a glass. With S + 1.0 D ⊃ c + 1.0 D axis 90 reads J. 1 at 8 inches with ease. Prescribed: RES — 2.25 D ⊃ c — .075 D axis 180°; LES — 12.0 D ⊃ c — 2.0 D axis 180°. The patient was allowed to resume her work as a teacher.

December 18.—The patient is conscious of an improvement in her sight since her last visit. By actual test, the sight of the right eye is $\frac{20}{40}$ +, with the glass worn. With this correction, she uses the right eye for the distance, and the left eye for near work. She rejoices that she is no longer so absolutely dependent upon her glasses. She is using her eyes with great comfort, and is happy beyond expression. Furthermore, she is determined to have the left eye operated upon in June.

PATHOLOGICAL EXAMINATION OF A BI LATERAL CONGENITAL CRYPTOPH-THALMUS IN A RABBIT.

By Dr. LUDWIG BACH, Würzburg.

Translated, Abridged, by Dr. Ward A. Holden.

(*With Plate I. of Vol. XXXII., German Edition.*)

CRYPTOPHTHALMUS was the name given by Zehender and Maury to a malformation in which lids, brows, and palpebral fissure were wanting, the skin of the forehead passing uninterruptedly over the eye. The genesis of this malformation has not been clear, but the case which I now report, occurring in a rabbit, throws considerable light on the subject.

The literature is as follows: Zehender saw such a case in an infant which died at the age of eight months. The head was normally formed, but the palpebral fissures, lids, and brows were wanting. The skin covering the orbits was somewhat elevated by the underlying eyeballs. There were also malformations of the fingers and genitalia.

The microscopic examination was made by Manz. The sagittal diameter of the right eye was 30 *mm*, the anterior chamber including nearly one-half of this. Both anterior and vitreous chambers were filled with a gelatinous substance, apparently vitreous humor. The anterior and posterior portions of the eye were separated by a septum, with one excentric aperture, which was composed of elements of the lens, and had on its anterior surface a capsule and normal subcapsular epithelium. The iris was wanting. The large cornea

was fairly normal in structure, and its surface was in connection with the loose cellular tissue of the overlying cutis, there being no conjunctival sac. The choroid, retina, and optic nerve presented normal conditions. The left eye was shrunken. In the skin overlying the eyeballs there could be found no lashes, glands, or lachrymal canaliculi, only the orbicularis muscle being found well developed.

Following this came Hocquart's case in a woman of thirty, whose body came to the dissecting-room without any previous history. The skin of the face passed smoothly over the orbits. The eyebrows were well developed, and just beneath them were two openings the size of a pin-head, about which the skin was thrown into radial folds, and behind which lay very small eyeballs. The opening in the skin led into a narrow sac in connection with the ball, which was lined with epithelium and contained in its walls some muscle fibres but no lashes, Meibomian glands, or tarsus. The cornea was not fully developed, and the iris and lens were wanting, but the retina, pigment epithelium, pars ciliaris retinæ, and zonula fibres were normal. In the right eye the fœtal choroidal cleft could be seen extending forward from the optic-nerve entrance. Hocquart believed the condition to be due to a defect in development and not to inflammation.

Under the title "Congenital Anchylo- and Sym-blepharon," Chiari described the ocular conditions of a still-born infant with other congenital malformations. On the left side there was no palpebral fissure. The eyeball was small, and there was no conjunctival sac. The interior of the ball was filled with a soft cloudy substance in which were enclosed portions of lens, retina, and choroid, which had undergone pathological changes. Chiari regarded the condition as being the result of intra-uterine panophthalmitis.

Three further cases have been described clinically by Van Duyse, Otto, and Fuchs.

In the rabbit which I examined there was no palpebral fissure on the right side; on the left there was a cleft 2½ *mm* long to the temporal side. Immediately along the line of junction the hairs were very sparsely developed, but else-

where on the upper and lower lids the hair supply was normal. Lashes were present only in small quantity. No other malformations were noted. The place of junction was nowhere elevated, but, on the contrary, rather somewhat retracted.

On the right side I unfortunately detached the lids from the underlying ball; on the left side the ball was removed with the lids. The conditions on the left side will be described first.

The ball was slightly diminished in size.

The specimen was fixed in 5-per-cent. formol, hardened in alcohols of increasing strength, imbedded in celloidin, cut in serial sagittal sections, and stained with hematoxylin-eosin, a few sections being stained with thionin.

The anterior surface of the lids is normal, except at and near the lid margin, where there is considerable thickening of the epidermis. This thickening of the epithelium continues over to the neighboring tarsal conjunctiva. Elsewhere the epithelium of the conjunctiva is not abnormal. At the fornix above and below a fold is thrown out into the small conjunctival sac. The scleral conjunctiva has grown over and is adherent to the marginal portions of the cornea.

Both in the lids and in the conjunctiva are seen signs of former inflammation.

At the temporal side there is a narrow cleft between the lid margins which gradually closes toward the nasal side, as is shown in the three figures on Plate I.

In the upper lid the tarsus, the Meibomian and Waldeyer's glands, the lachrymal apparatus, and the orbicularis and levator muscles are all present. The lower lid is merely a fold of skin without any of the characteristics of a lid.

The central portion of the cornea is thickened and pervaded with vessels, and the iris is adherent to it for a considerable extent. The iris, which is normally developed, exhibits signs of previous inflammation. The ciliary body, choroid, retina, and lens are normal.

On the right side there was no palpebral fissure, the lids being united along their entire margins. Otherwise the

conditions of the lids and ball were similar to those on the left side.

I have no doubt that the cause of the malformation in this case was an intra-uterine inflammation. The condition of the lids, cornea, and iris are all indicative of this. Nor were signs of inflammation wanting in any of the cases previously reported. Still, the fact that in some of these cases malformations were found in other parts of the body, suggests the possibility of other factors having taken part in the production of the condition. Other cases must be examined before we can arrive at an absolute and definite conclusion.

Explanation of the Figures on Plate I.

FIG. 1.

a, upper lid.

b, lower lid.

c, projecting retrotarsal fold of the upper lid.

d, " " " " lower "

e, epithelial adhesion of the projecting retrotarsal fold of the upper lid to the inner angle of the margin of the lower lid.

f, follicles.

g, broad adhesion of the iris to the cornea.

FIG. 2.

a, *b*, *d*, *f*, and *g* as in Fig. 1.

c, projecting retrotarsal fold of the upper lid, here united with the lower lid by a bridge of connective tissue, *e*.

h, epithelial adhesion between upper and lower lids.

k, cleft, bounded anteriorly by the posterior surface of the upper lid, and posteriorly by the anterior surface of the upper retrotarsal fold.

FIG. 3.

a, *b*, *d*, *f*, *g*, and *k* as in Figs. 1 and 2.

e, broad bridge of connective tissue between upper and lower lids.

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ON CONGENITAL ANOMALIES OF THE OPTIC DISC.

By Dr. CASPAR, of Mülheim on the Rhine.

Translated and Abridged by Dr. J. Guttman, New York.

(With Lithographic Plate II. of Vol. XXXII., German Edition.)

In comparatively numerous cases, we find on or upon the entrance of the optic nerve membranous or hypertrophic structures of a bluish-white color, which undoubtedly are not due to pathological changes. Up to the present time I have seen seven cases which presented this appearance; thus giving a proportion of about 1 to 1500 cases. If we consider the proportion of opaque nerve fibres on the optic nerve or in the retina as 1 : 600 (according to my journal), we see that, as regards frequency, the first-mentioned picture is not much rarer than the latter. It is, therefore, quite astonishing that the most commonly used text-books —excepting some foreign ones—make no mention whatever of the forms in question, whereas the so-called rabbit formation is quite extensively discussed. I think it, therefore, worth while again to draw attention to these anomalies, by reporting the following cases:

I.—MEMBRANOUS FORMATIONS ON THE OPTIC NERVE.

Case 1.—H. H., twenty-four years old, called upon me on January 30, 1894, on account of a foreign body on the right cornea. Otherwise both eyes are normal. The left optic nerve shows an abnormal picture (Fig. 1, *erect. im.*). At the bifurcation of the upper veins, which include the upper trunk of the artery, a white, fibrous, and shiny membrane covers all three blood-vessels. The membrane has a triangular form, one angle of which points up-

ward and almost reaches the margin of the papilla. Here, as well as on both the right and left sides, the terminations are well marked. Differences in level by examination in the erect image are not detectable. The structure evidently lies directly upon the optic nerve. A second membrane, much smaller than the first, covers a part of the lower margin of the optic nerve and the inferior blood-vessels. The peripheric part is distinct, and the apex is directed down and out. Ten months later the condition was absolutely unchanged.

CASE 2.—J. H., twenty-six years old, called on August 8, 1895, to be examined for eye-glasses. The optic nerve in the left eye (Fig. 2) seems to be entirely covered with a uniformly delicate whitish membrane. It is shield-shaped, and its boundaries are well defined on all sides, but least below. The blood-vessels are clearly visible through the membrane, but appear perfectly distinct only beyond its borders. Here, also, the structure lies directly in front of the plane of the optic nerve.

II.—INTUMESCENCES.

A. On the Border of the Optic Nerve.

CASE 3.—M. R., twenty-one years old, called on June 2, 1894, in regard to a foreign body in his right cornea. The left eye has normal vision. The entire nasal half of the margin of the disc (Fig. 4) is covered by a protruding, sharply defined mass, which has a glassy or gelatinous appearance. It is situated exactly on the border of the papilla and covers it in the form of a crescent; its greatest breadth is equal to the diameter of two broad retinal veins. The mass terminates near the middle of the upper and lower borders of the optic nerve, in the form of a cusp. The underlying blood-vessels are faintly visible.

CASE 4.—The right eye shows the same anomaly, but less distinctly.

CASE 5.—N. R., forty-six years old, came on August 20, 1892, to be treated for an injury of the conjunctiva of the right eye. The vision of the left eye is $\frac{4}{5}$ with $+ 1.5$. The lower-inner border is covered by a prominent mass (Fig. 5) which shows the same form as the one described in Case 3.

B. Upon the Papilla Itself.

CASE 6.—W. K., thirty-five years old; August 8, 1894, corpus alienum on the right cornea. Vision is normal. On the lower-

inner quadrant of the otherwise normal right optic nerve (Fig. 6) and not far from the origin of the retinal blood-vessels, there is a glassy, transparent, small patch of a bluish-white color.

CASE 7.—P. M., twenty-three years old, suffers from hyperæmia of the conjunctiva and spasm of accommodation in both eyes. The left optic nerve is covered by an S-shaped mass (Fig. 3). The boundaries are well defined. The color is shining white and in parts bluish. The mass is broadest and apparently almost opaque in its upper half, whereas its lower end, which lies on the nasal side of the origin of the blood-vessels, possesses only the thickness of a retinal vein, and in the erect image is still distinguishable as a slender bluish-gray bright streak. Above, the band has two or three times the breadth of a broad retinal blood-vessel, is covered on all sides with toothed offshoots, and extends into the retina.

Cases such as are mentioned in Group I. are also described by Fuchs[1] and Hirschberg.[2] The membranes are considered to be connective-tissue formations and congenital anomalies.

It is the same with the five cases of Group II. Cases like those illustrated by Figs. 4 and 5 have to my knowledge not yet been described. The others are described by Masselon,[3] who regarded such structures as are shown in Fig. 6 as congenital elongations of the tissue of the lamina cribrosa into the corpus vitreum; finally Berger,[4] whose three cases resemble our last one, Fig. 3. According to his view we are dealing with connective-tissue layers, the result of an intrauterine inflammatory process. The ophthalmoscopic picture in our last case has indeed much resemblance with the bands of retinitis proliferans. The small extent of the structure, the absence of any other complication, the normal function of the eye—all make it probable that the previous bleeding or inflammation, if we wish to consider it as such, dates back to the time previous to birth.

Regarding the cases 3, 4, and 5, I think it rather more probable that here the flaky and glassy connective-tissue

[1] *Arch. f. Ophth.*, xxvii., 1, 139.
[2] *Beitr. z. pract. Augenheilk.*, 1878, S. 64.
[3] *Manuel d'ophtalmol.*, p. 136.
[4] *Klin. Monatsblätter f. Augenheilk.*, 1882, p. 269.

masses are due to a deficient clearing up of the fœtal corpus vitreum, *i. e.*, the hyaloidea. Finally, I have no doubt that we have here to deal with congenital abnormities of different causes. A systematic treatise of this seemingly not very rare anomaly can only throw light upon the origin when a number of such eyes have been examined anatomically.

NOTES ON BLEPHAROPLASTY ACCORDING TO FRICKE.

By Dr. JULIUS VON SIKLÓSSY, Jun., Budapest.

Translated by Dr. Edwin M. Cox, New York.

(*With double plate B C of Vol. XXXII., Germ. Ed., and two figures.*)

IN the following pages, a few notes are made upon Fricke's operation of blepharoplasty. We have frequently employed this form of operation, and consequently are able to collect numerous instances of it. The form of operation is one of the best, but has given us good results only when it was not carried out according to the well-known descriptions of some text-books, but when we allowed ourselves to make some alterations which we will describe.

The method is useful for the highest degree of ectropion. After the conjunctiva is freed from its attachments, we divide the scar tissue by two semilunar incisions (Fig. 1), or free it by a single incision parallel to the lids, but as far away as can be conveniently arranged. Cases in which the lids are adherent to the orbital region are the most difficult for this operation.

The incision should be begun in the middle, and continued first outwards and then inwards, and the division of tissue should reach to the conjunctiva. Preservation of the orbicularis is important.

Now we can proceed to the formation of a covering for the defect thus caused. The flap is obtained from the forehead to the outer side and above the brow for the upper lid, and for the lower lid somewhat farther down.

If we take the flap from too near the orbital margin, the later cicatricial contraction may cause a new ectropion. The size of the flap is carefully marked out, and it should then be freed from the underlying tissues. The outer line of incision may be lengthened to secure relaxation, and the sutures then introduced. The turning of the base of the flap may cause an inequality in the skin-surface near that point, and this may be excised if necessary. Suturing should be begun at the outer border and continued along the upper line first.

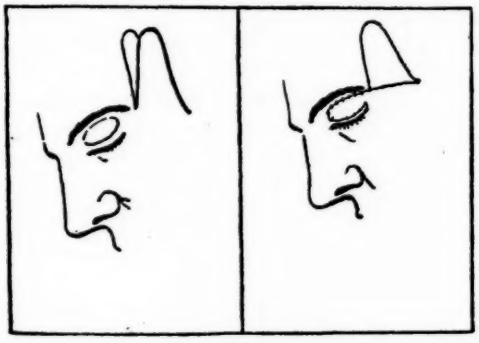

FIG. 1.

It is of some interest to read the account of a case operated upon by this method. The lid was everted to such an extent that the lashes touched the eyebrow. The operation was begun by the freeing of the scar 2½ lines above the superior palpebral border at a distance of 3 lines from the inner angle of the eye, and was continued in a bow-shaped line to a point above the external angle of the eye. Since the skin of the temple was involved in the scar, the plastic flap could be made only from the skin of the cheek, and this was done so as to get as wide a base as possible. The wrinkle in the skin at the base of the flap caused by its twisting was excised, and the flap sutured in place. There was some gangrene at the peripheral end of the flap, but otherwise the result was excellent.

In the year 1829, Jüngken[1] recommended the same method, only with a narrow flap, for lagophthalmus. He

performed the operation twice, but did not get a successful result.

In 1874, Siklóssy (Senior)[2] offered an important modification, which since then has been found useful by Arlt[3] and Czermak.[4] According to him it is of special importance, when the temporal region is made use of, to make the flap in a vertical direction, and to form the base some lines deeper than the border of the normal upper lid with the eye closed. How valuable this procedure is, becomes clear when we remember that subsequent shrinkage occurs in the direction of the axis of the flap. It is also important that the angle between the flap and the surface left by its removal should be an acute one, so as to avoid the effects of torsion and not to interfere with the nutrition of the tissue. When we also consider that the skin of the temporal region, even if not so soft and yielding as that of the lids, still has considerable similarity to it, we should be satisfied with the results obtained by this method. This is the method by which the cases in the Rochus-hospital in Budapest have been operated upon, to the number of 16–20 annually.

Experience teaches us that when a method of operation is to be considered classical we cannot consider it as typical, since each case requires special modifications to suit its particular characteristics. The minutiæ of which the whole operation consists, the clear views of the aim of the operation, of the means at our disposal for its accomplishment, of the extensive freeing of the adherent cicatrices, of the size, shape, and location of the flap, of the dissection of the adjacent skin, by which suture of the wound left by cutting the plastic flap is made possible, and finally of correct understanding of asepsis and suture methods,—all these factors have important bearing upon the permanent success and cosmetic result of the operation.

Much depends upon how we fit together the edges of the wound, and how in each case we distribute as equally and over as large an area as possible the tension, so that during and after cicatrization the result may be good in the cosmetic sense. It is a well-understood matter that the suturing of the defect left by the removal of the flap should be

done in a certain way, but it appears to be worth noting that the first sutures should be introduced at the point where it is intended the flap should begin its turn into its new position.

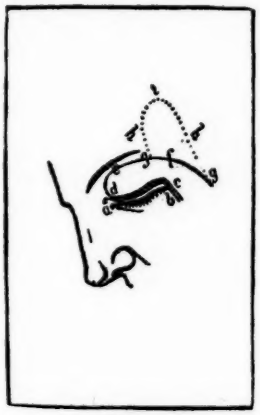

FIG. 2.

a, *b*, line of closed lids.
c, *d*, *e*, *f*, area to be covered, with flap in place.
g, *h*, *i*, *h'*, *g'*, boundaries of wound left by removal of flap.

The number of sutures for the secondary wound should depend upon the tension, and they may be placed from 2–8 *mm* from the edges of the wound, and should consist of moderately strong silk. Accurate apposition of the wound edges is important, and between the coarser sutures it may be necessary to introduce a few of finer silk, in order to distribute the tension as much as possible.

When we have sutured the secondary wound, we must fit the flap accurately into the surface on the lid, and suture it in place with interrupted sutures of fine silk; continued sutures are not suitable for such cases, since if there should be suppuration at one or more points we are unable to remove single sutures. The suturing should be done so as to bring together, if possible, histologically similar structures. If the wound edges are slightly bevelled, before suturing, the tendency to cicatricial turning in will be overcome.

In order to insure a permanent good result, it is well to make the first incision designed to loosen the cicatricial connections of the lid as close to the ciliary border as possible. This overcomes the possible later tendency to ectropion. Should a distorsion develop, we draw the lid directly upwards, make a freeing incision at the upper convex tarsal border, and try to cover the defect with a flap. An ectropion may occur upon dynamic principles when the flap is too freely dissected away.

Finally, it may be mentioned that, in a case of ectropion of the inner half of the under lid, a flap may be taken from the forehead with its base not on the bridge of the nose, but on the lateral surface of the nasal bone, so as to place its base as much out of sight as possible. The accompanying plates show some cases operated upon.

We cover the region of the operation with tin-foil in order to make the dressing easy. After operation, both eyes are bandaged and the patient is kept in bed. After six or eight hours we examine the wound for evidences of hemorrhage, and then allow the dressing to remain twenty-four hours more.

In changing the dressing, we should begin at the base of the flap, and exert all tension in the direction of the long axis of the flap, so as not to disturb the recent adhesion of the wound surfaces. Dressing should be done every day, and on the fourth or fifth day we may remove the tin-foil, and substitute an ordinary gauze dressing, applied so as not to exert pressure to an undue extent.

It seems suitable to contribute here some of my cases operated upon by Fricke's method, in some ways modified to suit the particular case. In one of the cases the flap was taken with its base internal near the beginning of the nose, and in the other with its base externally from the temporal region. I present, also, among others, the photograph of a man operated upon twenty-four years ago, according to Fricke's method, for ectropion of the upper lid.

CASE 1.—B. K., twenty-four years old, day-laborer, came to the hospital May 12, 1894. He had a hypopyon keratitis which had caused him severe pain for eight days.

In addition to his corneal trouble, he had the whole left side of his face involved in a cicatricial formation, which included the skin of the temporal region, the ear, the side of the nose, the inner angle of the eye, and part of the brow (Fig. 1 in the plate). The cause of the burn was sulphuric acid. The upper lid was covered with thin, smooth scar-tissue, and also was shortened, but the tissue in this region was in better condition than elsewhere, since it was somewhat movable on the subjacent parts. The shortening of the upper lid was, according to measurements, about 5 or 6 *mm*, and the eye in consequence was unprotected. The shortening of the lower lid was much more important, for it was entirely involved in the dense scar-tissue, forming really nothing more than a strand of scar-tissue about 3 *mm* wide. The deformity of the face was much increased by the distorsion of the angle of the mouth and the ear.

On May 27th Fricke's operation was done. When the scar-tissue was divided and the ciliary border restored to position, there was a raw surface about as wide as a normal lid. The hemorrhage was somewhat troublesome on account of the density of the scar-tissue, some of which had to be removed in order to get a satisfactory flap from the forehead. A flap was cut from the forehead in a perpendicular direction, with its right line of incision in the middle line of the body, and its pedicle as much as possible in the inner angle of the orbital cavity. Sutures were introduced accurately, and special attention given to the inner angle of the lid. Primary union occurred, and the patient left the hospital in eighteen days in the condition shown in Fig. 2 of the plate.

Case 2.—Helene S., aged four. Total loss of the upper lid. The child is tubercular-looking, and has scars and enlarged glands in its neck. There is complete ectropion of the right upper lid, apparently from tubercular periostitis and ulceration, and the ciliary border was close against the brow. The conjunctiva was hyperplastic, swollen, and dark red, and in the cornea there were several scars. Fricke's operation, August 10, 1894. The first incision along the ciliary border replaced that portion of the lid to an approximately normal position. The plastic flap was cut from the temporo-frontal region with its pedicle about 1 *cm* lower than

the commissure of the lids. The course of the healing was entirely normal, and the child was later transferred to the surgical division of the hospital. Figures 3 and 4 in the plate show the child before, and four weeks after, the operation.

An ectropion of the outer part of the lower lid, caused by the scar following periostitis, was operated upon some years ago, and the defect closed by a tongue-shaped flap taken from the cheek, as is shown in Figs. 5 and 6 in the plate.

Of all methods of blepharoplasty, the best according to my view is that which employs the flap with a pedicle, and the later results are usually very good if all precautions are observed.

The method of sliding flaps (when it is possible) is better than that of Fricke, since there are no secondary scars, and the tissue employed to make the new lid is of nearly the same quality as in the one destroyed.

References.

[1] Jüngken, *Die Lehre von den Augenoperationen*, Vorrede, 1829.
[2] Zehender, *Klin. Monatsbl. für Augen.*, 74, p. 228.
[3] Arlt, *Graefe-Saemisch, Arlt, Operationlehre.*
[4] Czermak, *Augenärtzliche Operationen*, 1892–94, p. 219.

A CASE OF RETINITIS CIRCINATA.

By Dr. JOSEPH WELTERT,

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Translated by Dr. SELINA BLOOM, New York.

(*With Colored Plate VI., Vol. XXXII., German Edition.*)

About the end of February, 1894, a young girl presented herself at this hospital for examination, complaining of poor sight and giving the following history:

Louise Fr. v. B., twelve years old, had had jaundice at four, and measles at ten years of age, having always been otherwise perfectly well. The mother of the patient had died of an unknown disease nine years previously. The father and only brother were living and well. Since November the patient had noticed an opacity L., when looking at near objects. For three weeks her sight has also failed for distant objects, and has been getting constantly worse for near objects.

Status præsens: February 28th.—The patient is an intelligent, healthy-looking child. Urine free from albumen and sugar. R. eye normal. L., outer parts normal, pupillary reaction prompt, media clear, $V = \frac{15}{200}$. Papilla somewhat hyperæmic, slightly swollen, the large vessels distended with blood, the lower half of the retina slightly œdematous. The whole macular region (Plate VI.), and the adjacent parts of the retina, extending tolerably far toward the periphery, show pathological changes. In the macula there is a peculiar radiating, irregularly oval figure, composed of partly intensely white, partly whitish-yellow patches, with intervening larger and smaller aggregations of pigment. The very centre of the macula shows no pigment. Black and white patches, over which the retinal vessels pass, are also seen on the temporal side of the macula, and are here arranged in the shape

of an arc. Visual field concentrically contracted, showing a central half-scotoma. Sense of light 50 (Förster's photometer), color-sense normal.

Treatment: Inunctions, begun March 3d. Body-weight = 35½ K. before and after the inunctions.

March 20th.—V = ⅝. Visual field larger, no scotoma, papilla less œdematous, the white figure in the centre of the macula smaller and slightly yellowish-brown. The picture otherwise the same as in the beginning.

March 31st.—V = ½ barely. Sense of light 8; the white figure in the centre of the macula now contains patches of pigment arranged radially.

April 2d.—Patient dismissed from the hospital with no other treatment than the wearing of dark glasses. L. V = ½. Visual field for white and red normal. Sense of light and color for both eyes normal. Ophthalmoscopic picture unchanged except that there is more pigment than at first. The white patch in the centre of the macula is now almost entirely replaced by radiating patches of pigment, that form the centre of the whole radiating figure. General examination shows the patient to be healthy, no heart affection, urine free from albumen and sugar.

April 11th.—L. V = ½. Still more pigment in the macula region. In June, L. V = 1 barely. Pigmentation somewhat lessened.

December 28th.—R. V = 1 E. L. V = 1 E. A little to the outer side of the macula is seen a rather large white atrophic patch, over which the retinal vessels pass.

March 7, 1895.—R. V = 1 E. L. V = 1 E. Papilla normal, pathological changes unaltered, except for the distinct decrease in the amount of pigment.

September 25th.—R. V = 1 E. L. V = ⅞. The patient declares that about three weeks ago she noticed that her sight became suddenly worse again without any special reason. Ophthalmoscopically the picture had remained about the same, only that the small white spots had run together more to form larger patches and the pigment had decreased still more. Below and to the outer side of the papilla, there were fresh patches composed of small white spots.

In vol. xxxix. of *Graefe's Archives*, Fuchs has described twelve cases under the title "Retinitis Circinata," which

show an undoubtable similarity to our case. Fuchs characterizes the disease in the following way:

"Retinitis circinata is characterized ophthalmoscopically by the presence of a grayish or grayish-yellow opacity in the macula and its neighborhood, surrounded within a certain distance thereof by a zone composed of smaller white spots or large white patches" (page 262). Retinitis circinata was so called because the small white spots are arranged around the macula spot as the vesicles in herpes circinatus are around one point.

Retinitis circinata is a very rare disease. Fuchs has observed eight perfectly typical and four less typical cases in seventy thousand patients; ten of these twelve were of the female sex, so that it seems that this sex is more predisposed to the disease than the male; only one eye was affected in seven of the twelve above-named cases; further, all the patients were of advanced age, the youngest being thirty-eight, the oldest seventy-five years of age. Our patient, on the contrary, is so remarkably young that senile changes are excluded. Beside the twelve cases of the Vienna clinic, but one similar case has been described, up to the present time, by de Wecker and Masselon (Ophthalmoscopie Clinique, second edition, Fig. 41). Fuchs also regards this case as an example of retinitis circinata.

Retinitis circinata produces for the patient no noticeable symptoms, except the great disturbance of vision caused by the widespread changes in the fundus. These changes are situated partly in the macula, partly in the neighborhood of the macula, the latter being arranged in such a way as more or less circularly to surround the former. Between both these remain smaller or larger areas of normal retinal tissue.

The changes in the macula, called by Fuchs for convenience, "macula-spot," form in our case a transverse, not perfectly regular oval, comparable to the picture of a transversely placed pear, with the slender part of it pointing temporally, and which in size is larger than the papilla. This figure has a distinctly radiating appearance. The patches unite in the region of the macula lutea, and are composed of small white or whitish-yellow dots, which seem elevated above the

surface of the retina. Between the individual rays there is a considerable amount of pigment. The blood-vessels to the macula lutea are seen to pass over the white and black patches without being at any point covered by them (*vide* Plate VI.).

To the temporal side, a short distance from the macula-spot, and separated therefrom by normal retinal tissue, are several patches of varying size, which are arranged in the shape of an arc around the macula, and are composed of small white spots. Between these patches there are pigment deposits. Fuchs calls these patches "macula-girdle," and describes some cases in which the macula-girdle completely encircles the macula-spot, elliptically, whereas in others it only partly surrounds the macula-spot, and instead of being a continuous girdle, is an interrupted one. In our patient the macula-girdle is situated to the temporal side of the macula, between the large temporal vessels. Only a very few changes lie outside of these vessels. Fuchs observed that the girdle usually occupies the same position in the fundus, whereas its relation to the peripheral course of the vessels varies in individual cases. We find thus three very distinguishing characteristics of the macula-girdle: its situation, its shape, and its finer structure.

It will be long before the question as to the pathological anatomy of retinitis circinata will be settled. Fuchs says that the little spots lie back of the nerve-fibre layer of the retina, in which layer the ophthalmoscopically visible large vessels run (page 263), this being proven by the fact that these retinal vessels are seen to lie free everywhere. Professor Schiess, who discusses our case in a cursory way in the *31 Jahresbericht der Augenheil-Anstalt*, Bâle, believes that it is a chorio-retinitis, in which the retinal changes appear more prominent in the beginning, because the opaque retinal tissue hides the choroidal changes. Later the choroidal changes become more visible, as is often the case in chorio-retinal processes. In our case there were pigmentary changes present from the beginning, which, however, increased considerably later on; especially remarkable is the appearance of pigment in the macular region, where there

was absolutely none in the beginning, and the partial disappearance of the same afterwards. Our case has a certain dogmatic significance for the question as to the participation of the choroid in the process. Fuchs says that he has also seen accumulations of pigment in old cases, but he holds that these are secondary changes.

The origin of the small white spots was thought by de Wecker and Masselon to be in fatty degeneration of hemorrhages. Fuchs is inclined to believe that they are due to "an effusion of fibrinous fluid into the retina, which causes the retinal elements to be pressed asunder" (page 264). According to the opinion of Professor Schiess, the changes are similar to those encountered in the star-shaped figures of retinitis albuminurica, which places them under the category of fatty degeneration in the nuclear layers. Other explanations of the pathological anatomy of these spots are: sclerosis of the nerve-fibres, also accumulations of round cells in the retinal tissue.

The etiology of retinitis circinata is just as obscure as the pathological anatomy. In our case, too, we can find no definite cause. Repeated examination showed the patient healthy, perhaps slightly chlorotic; though special attention was paid to the possibility of a heart affection, no symptom of any could be found. According to the history, which was tolerably reliable, there had been no previous illness which could reasonably have been made responsible for the eye trouble. The advanced age of the patient, which could be taken as a cause in the cases described by Fuchs, fails entirely in our case. As the urine had been repeatedly examined for sugar and albumen, with negative results, we may exclude disease of the kidneys as causing the changes in the fundus; it is also not probable that this typical picture could depend upon a circulatory disturbance, the youth of the patient and the repeated careful examination excluding it. Colloid excrescences of the chorioidea are changes of advanced age usually.

The visual disturbances in retinitis circinata usually come about very gradually, but they increase considerably in the course of time. Our patient noticed these disturb-

ances three weeks before she presented herself for examination; at first came the disturbances for near vision, soon afterwards for distant vision. Visual acuity sank until there was only the ability to count fingers at fifteen feet. Added to this there were narrowing of the field of vision and a central half-scotoma, and a greatly diminished sense of light, color-sense remaining normal. This case is peculiar on account of the course of the disease, which differs considerably from that of those described by Fuchs, the differences in the state of the visual acuity at different times in the course of the process being especially interesting. On admission to the hospital, the vision was $\frac{15}{200}$; it improved while the patient remained there until it reached $\frac{1}{2}$, to become normal within five months afterwards. It remained good for one year in spite of the persistence of the ophthalmoscopic changes, which, except for some decrease in the amount of the pigment, had remained the same. Now for three weeks the vision has been reduced to $\frac{2}{4}$, without any other perceptible change. The decrease in vision came suddenly this time without any plausible reason to the patient, but was probably due to some fresh inflammatory changes found in the choroid. In the cases of the Vienna clinic, improvement of vision was never observed, which fact caused Fuchs to come to the following conclusion: "The changes in the fundus may disappear or they may cause a lasting thickening of the retina; in every case, however, the visual acuity is forever damaged" (page 263).

It seems, therefore, that our case is especially interesting because of the differences between it and the above-mentioned twelve cases. *We know, as a result of our observation, that it can occur, not only in old but also in young persons; further, it is made very probable by the course of the disease that the choroid plays an important part therein, and it seems that medicines which induce absorption exercise a favorable influence upon the improvement of vision, a fact which the long duration of normal vision would seem to indicate.*[1]

[1] In vol. xxxv. of the Germ. Ed. of these ARCHIVES there is an article on retinitis circinata, with anatomical investigation and the literature on the subject, by Dr. E. Ammann, Zurich. The article will appear in our next number.—ED.

A CASE OF EXOPHTHALMUS WITHOUT PULSATION, BUT WITH A BRUIT, AND WHICH ENDED IN SPONTANEOUS RECOVERY.

By DAVID COGGIN, Salem, Mass.

IN the ARCHIVES, June, 1883, I reported the history of a patient having pulsating exophthalmus. Death ensued in five days after the ligation of the left common carotid artery. An aneurismal dilatation was found in the cavernous sinus.

March 24, 1890.—Miss L., aged thirty years, of Irish parentage. V = $\frac{5}{6}$ *o. u.* Hm. 1.25. Weak *interni.*

Sunday, May 30, 1897.—Dr. J. Allen, of Topsfield, telephoned that Miss L. had suffered much with pain in her right eye for two days (while menstruating); that the pupil was widely dilated, the eye was congested and its vision affected. As the trains were not running, I suggested the use of a one-per-cent. solution of pilocarpine muriate.

May 31*st.*—Pupil well contracted. The usual symptoms of glaucoma not present. The pupil was too small to allow the use of an ophthalmoscope. Eye prominent and pressure painful. No pulsation recognized. No chemosis or other signs of orbital cellulitis. Heart sounds normal, as was the temperature. Movements of the eye restricted. No pain, morphine having been taken the preceding evening. Has had attacks of muscular rheumatism.

June 1*st.*—Pilocarpine omitted yesterday. Pupil again widely dilated. Ptosis. Ophthalmoplegia externa, though there was a slight action of the *internus*, over the insertion of which there was a small ecchymosis. Palpation less painful. Made out Sn. 1 with + 1.5 glass. V = $\frac{5}{18}$. Media normal. Contour of disc irregular (which was not noticed in 1890). Being utterly baffled, I

asked Dr. Allen for his stethoscope, and, on applying it to the affected eye, a loud bruit at once established the diagnosis.

The noise ceased on pressing upon the common carotid. The beating was distinctly heard on pressing the cup on the temporal fossa. Turning to the patient, I asked if she had noticed a noise in her head, and she said she had suffered for some days from a terrible thumping, but she had forgotten to mention it! As the symptoms indicated a dilatation of the carotid artery in the cavernous portion of the canal, she was advised to go to the Massachusetts General Hospital and have the vessel tied.

June 22d.—The patient walked into my office. No noise for six days, therefore it lasted from May 28th to June 16th.

She congratulated herself because she did *not* go to the hospital! No bruit detected on using a stethoscope. Ptosis less. Mydriasis persists; pupil contracted readily on using pilocarpine. Some pain in or behind the right eye, which is still somewhat prominent.

The external rectus, the only external muscle, still paralyzed. With a 6° prism, base out, the diplopia disappears. V = $\frac{6}{18}$ — 2. = $\frac{6}{8}$. Retinal vessels fine, outer half of disc pale. Field normal.

July 8th.—No pain for two weeks.

August 27th.—Diplopia more annoying. Prickling sensation in skin beneath eye, and it extends to the temple.

November 17th.—V = $\frac{6}{8}$ with —.50 = $\frac{6}{8}$ ($\frac{6}{9}$ *o. s.*). The externus quite paralyzed. 30° base out gives single vision.

The apparent disorganization of the sixth nerve makes it seem probable that the site of the lesion was on the outer side of the carotid. Œdema in the apex of the orbit might account for the transient ophthalmoplegia externa as well as for the impaired vision.

In the way of treatment, potassium iodide and strychnine were given, perfunctorily.

THE PROCEEDINGS OF THE OPHTHALMOLOGICAL SECTION OF THE INTERNATIONAL CONGRESS IN MOSCOW, AUGUST 19–26, 1897.

By Dr. A. NIEDEN, Bochum.

Translated by Dr. Edwin M. Cox, New York.

The Congress in general, as well as the Ophthalmological Section, was a success in every way, and the opportunities for thorough scientific work in this section were more favorable than in the larger meetings. The meetings were held in the excellent ophthalmic clinic of Professors Krükow and Ewetzky. Ninety-four papers and demonstrations were presented, among which there were 48 in German, 44 in French, and 2 in English. About one hundred and twenty persons participated in the meetings, among whom were six women.

FIRST MEETING.

Dr. Knapp, presiding.

1. Uhthoff: **On the bacteriology of the corneal and conjunctival inflammations.**

According to the speaker, a bacteriological classification of corneal and conjunctival inflammations is not yet possible, and we are compelled to rely upon clinical appearances. Of the serpiginous ulcer, we may consider the Fränkel-Weichselbaum diplococcus the cause, and whether other micro-organisms can give rise to the same clinical picture must still appear doubtful. Mixed infections, with the occurrence of the pneumococcus, can also present the atypical picture of suppurative keratitis. Usually, however, in such cases (atypical hypopyon-keratitis) the course is that of a staphylo-streptococcus infection.

We have not yet succeeded in developing in animals by pneumococcus inoculation the characteristic appearance of serpiginous ulceration.

Unless the cornea has been perforated, the bacteriological condition of the hypopyon has always been negative. The micro-organisms in these cases come from the neighboring parts of the eye, and direct inoculation from injury is to be considered rarer. Only in cases of keratitis aspergillina (caused only by A. fumigatus) does this mode of infection appear to be the rule.

As further causes of keratitis in man are to be mentioned: 1. The Fränkel-Weichselbaum diplococcus. 2. Streptococci. 3. Staphylococci. 4. Pfeifer's bacillus. 5. B. pyogenes fetidus. 6. Bacterium coli. 7. B. pyocyaneus. 8. Diplo-bacilli. 9. Ozæna-bacilli. 10. Asperg. fumigatus. 11. B. tuberculosis. 12. B. lepræ.

Keratitic ulcers occurring in the course of gonorrhœa or diphtheria are not usually caused by the special bacteria of those diseases, but by secondary infection with other bacteria of suppuration. In the same way the bacillus of xerosis cannot be set down as the only cause of certain corneal diseases.

In conjunctivitis, so far as is known, the following are the special causes of the inflammation: 1. Neisser's gonococcus (unstainable by Gram's method) causes, as a rule, typical C. blennorhoica, but with lessened virulence; catarrhal appearances may develop, sometimes of a granulating character, not, however, typically trachomatous. The cases of purulent conjunctivitis in the new-born are caused in part by the gonococcus. 2. The Fränkel-Weichselbaum diplococcus (Gram's method) causes moderate, frequently contagious, self-limited conjunctivitis, chiefly in children, and complicated with catarrh of the respiratory tract, in which there is not uncommonly a false-membrane formation. 3. The Koch-Weeks bacillus (Gram's method does not stain) is considered as decidedly contagious, and causes a characteristic, often epidemic, conjunctivitis, with great swelling of the membrane. Corneal involvement is rare. This bacillus appears to be, with the gonococcus, a frequent causative factor in the granular suppurating conjunctivitis in the Egyptians. 4. The streptococci (not stainable by Gram's method) cause usually a violent inflammation, often unilateral, with involvement of the deeper parts, the iris, etc. Superficial false-membrane formation and diphtheritic necrosis of the conjunctiva with corneal

ulcerations (scarlatina, diphtheria) may result. A streptococcus septicæmia may cause an endogenous infection of the conjunctiva. 5. Löffler's bacillus diphtheriæ (Gram's method) may cause slight superficial pseudo-membranes, as well as deep, necrosing conjunctivitis, without the possibility of deciding upon the cause of such different behavior in the infection, beforehand. By means of the Ernst-Neisser staining method we can differentiate the xerosis bacillus from this one. In any case, there are moments when the entrance of infection in disease of the conjunctiva is most easily possible. The serum-treatment must be considered the most active therapeutic measure, and its use indicated in doubtful cases, but it is not so potent in cases of secondary corneal inflammation. 6. Diplo-bacilli (Morax, Axenfeld) (not stainable by Gram's method) cause an inflammation with a more chronic course, less appearance of irritation, less secretion, and less swelling. It is decidedly contagious, and seldom causes corneal involvement.

The pathogenesis of trachoma is not yet known, nor are the microorganisms of follicular catarrh, which are perhaps the pseudogonococci.

The bacilli of tuberculosis, lepra, rhinoscleroma, xerosis, actinomycosis, soor, etc., need not be considered as causes of conjunctivitis. A specific form of infection cannot be attributed to the staphylococci, the commonest inhabitants of the conjuctival sac, since mixed forms of infection occur in the same case.

In the discussion, Coppez ascribed to the toxins an important influence upon the nutrition of the cornea. Peters found diplobacilli frequently in cases of trachoma, but did not consider them characteristic of these cases, and Chibret saw the same species in various forms of conjunctivitis.

2. Stöwer (Bochum) called attention to **A form of keratitis caused by a pink-yeast fungus which he had had opportunities to observe in two patients as a marginal affection.** Cultures gave no positive result, although living yeast-cells penetrated the tissue, but without causing ulceration. Peters, Bellarminow, and Knapp took part in the discussion, and called attention to the fact that yeast-fungi occurred occasionally in corneal ulcers, but could not on that account be put down as the *causa morbi*.

3. Vignes (Paris) discussed the **Value of the different methods employed in the treatment of muscular asthe-**

nopia, and stated that the protopathic form, in which binocular vision still exists although fixation for near objects and permanent fixation are impossible, requires surgical interference. Tenotomy of the antagonists is, however, decidedly contra-indicated. Only limited advancement, in each eye according to necessity, of the insufficient muscles, with limited resection of the tendons, appears to be required. Vacher mentioned in the discussion the use of optical aids, and Darier called attention to the employment of hypnosis and suggestion in certain forms of neurasthenic and hysterical insufficiency.

AFTERNOON SESSION.

Dr. VIGNES, in the chair.

1. SCHANTZ (Dresden), on the **Development of the chiasm,** presented very instructive plates from sections of embryological specimens from the chick and from man.

2. KNAPP (New York) described his **Recent experiences with cataract-operations,** 1050 in number, of which the last 400 included all complicated cases. The method of operation was usually a simple extraction without iridectomy, and the incision at the border of the transparent cornea, almost half its extent. The capsule was opened with the cystitome to the extent of five or six *mm* in the upper part underneath the iris, so that the torn pupillary edge of the iris and the wounded capsule should not touch. Pressure at the lower part of the cornea easily delivers the lens, but contact of the border of the lid and the corneal wound should be avoided. Both eyes are bandaged afterwards, and the dressing changed after twenty-four hours, when any prolapse of the iris can be disposed of. Reaction of an inflammatory and mechanical nature was limited to six cases of slight iritis, two cases of partial wound infection, and four cases of purulent inflammation of the cornea. In 355 operations prolapse of the iris occurred fifteen times (7.6 %) and was successfully treated by iridectomy. Secondary operations were done in 40 % of the cases. In three cases, glaucoma following discission was observed. Recovery was obtained by means of iridectomy, eserin, and morphine.

The final result in the last four hundred cases was not quite so good as in the previous six hundred, still good vision was obtained in 93 %, fair in 4.5 %, and in 2.4 % there was total failure. In the former series of 600 cases, in two instances both eyes were lost

from sympathetic ophthalmia, the cataracts in these cases complicated. Dr. Knapp concludes with the statement that simple extraction has yielded him greater distinctness of vision, fewer failures, and better final results than any other method.

3. PFLÜGER contributed his observations upon the **Prevention of prolapse of the iris in extraction of the senile cataract.** The quality of the cataract, the method of operation, and the condition of the patient are three factors that influence the occurrence of prolapse. A large flap-section is the most important operative factor, and the wire speculum is a great help.

Iridectomy is indicated when (1) the pupil does not contract normally, (2) when there is prolapse of the iris present, and (3) when the patient cannot promise that he will remain quiet. In these cases a very small peripheric excision of the iris should be made, leaving the sphincter portion intact.

In the discussion, KUHNT pleaded for eclecticism in the matter of iridectomy, and states that in eighty per cent. of the cases he makes a subsequent discission of the capsule. ESSBERG (Hanover) thought cocaine injurious, and preferred holocaine. DUFOUR (Lausanne) always performed iridectomy when the cornea was small; and was in favor of non-interference in cases of prolapse, since after excision he had observed sympathetic affection of the other eye. VACHER (Orleans) removed the prolapse under chloroform if it occurred within twenty-four hours; if later, he awaits spontaneous recovery. KNAPP says that Pflüger's method,—excision of a small peripheric portion of the iris,—has, during the last three or four years, been systematically practised by several surgeons of the Massachusetts Eye and Ear Infirmary, as the annual reports of that institution testify.

4. NIEDEN (Bochum) spoke upon the **Consequences of anchylostomiasis in the eye,** mentioned the fact that the parasite was distributed over all civilized lands, and described the characteristic picture of the disease, with its resemblance to pernicious anæmia. Judging from 180 cases there is in seven or eight per cent. associated disease of the eye, in the form of hemorrhages curiously distributed in the retina, chiefly peripherally, in comparatively large areas and single foci. There is almost never the central white spot of resorption characteristic of leucæmia and scurvy. The visual disturbance is usually insignificant, whether the central portion of the retina is involved or not. The treatment can be directed only against the general disease,

and cure can usually be obtained by the use of extract of male fern. The influence of the toxins is apparently of importance in causing the hemorrhages. Accidental ocular affections occur during the disease in consequence of the anæmia, such as muscular paresis, weakness of accommodation, retinal asthenopia, peripheral contraction of the visual field, and nystagmus.

5. BAUDRY (Lille) showed a **Simple and certain method of discovering simulation,** by producing monocular diplopia with a simple prism. It appears to be a new modification of the well-known method of A. von Graefe. In 1881, Baudry called attention to the fact that it is easier for this purpose to use the base of the prism. Baudry's method consists in placing, at a distance of two or three metres, a candle with a red glass in front of it, by means of which the difference in color of the images seen through the prism can be equalized. The prism is arranged so that it is possible to allow the image to be seen first through its base, and then, by a movement invisible to the suspected person, through the thin edge. By first using only the sound eye for the development of the double images, and then, unknown to the patient, by substituting the apparently amaurotic eye, the deception will be easily and certainly demonstrated, since the patient cannot tell whether he has the base of the prism in front of his normal eye or the prism itself. The apparatus can be obtained from the opticians, Van Ackere and Brunner, of Lille.

SECOND MEETING.

Prof. FUCHS (Vienna), presiding.

Subject: **Trachoma**—in general discussion.

1. HIRSCHBERG presented statistics upon the occurrence of the epidemic granule disease in Europe, America, and Australia. At 1 or 2 per cent. a locality may be considered free from trachoma, at 10 to 15 per cent. moderately, and at 50 per cent. severely affected by the disease. Switzerland seems most fortunate. England and France have only rare cases, Belgium and some parts of Germany have very many. No part of Russia seems entirely free from the disease. Race-predisposition does not appear to exist, but it is a fact that trachoma is a disease of the poor. Terrestrial conditions, particularly swampy lands, are of decided effect upon the occurrence and spread of the disease. Since the disease is un-

doubtedly transmitted from person to person, prophylaxis demands better habitations, and special care in schools. Every child should be examined carefully for the disease, and those suffering from it kept apart. Treatment consists in an extra attention to cleanliness on the one hand, and better therapeutic measures, with suitable surgical procedures on the other, when necessary. Hungary possesses a good system of rules, which are applicable to as large an extent as possible. The medical expeditions of Russia are also very useful, and upon such measures rests the hope that Europe may some day be freed from its affliction of trachoma.

2. KNAPP, continuing the discussion, presented his views upon the nature and the mechanical treatment of the granular inflammation of the conjunctiva. He distinguishes a non-inflammatory and an inflammatory form. The former, frequent in America, is not contagious, and, not uncommonly, limited to one eye, and may probably get well spontaneously. The latter is contagious, and scars remain after its disappearance. The non-inflammatory form is more effectually treated by means of the roller-forceps than the contagious form.

The application of the pressure should be gentle, without much force, so that there shall be no injury to neighboring tissues. In the contagious form, we should use the chemical treatment in addition to surgical means, such as crushing and excision.

In the discussion, LOGETSCHNIKOW doubted the possibility of getting complete cure by the squeezing-out process, but nevertheless considered that process of value as an introduction to the later and more radical method with caustics.

3. KUHNT contributed very exhaustively his experiences in the treatment of trachoma, and referred the difference in the opinions upon the efficacy of different methods, to the confusion of follicular with trachomatous conjunctivitis. The question is important in localities otherwise free from the disease. A careful differential diagnosis is of fundamental importance, and must precede the treatment. Among 993 cases, in 65.2 per cent. there was nasal disease, and for this reason attention should be directed to the nasal cavities. Residence and material welfare are of much importance in treatment, as well as the condition of the general health. Treatment may be divided into three kinds: 1, chemical; 2, mechanical; 3, surgical. The two last may be preliminary to the first. Mild or moderately severe cases, in neighborhoods where the disease is not epidemic, heal often with

no treatment but the squeezing-out. Rubbing with sublimate solution can only seldom give permanent success, especially where the disease is epidemic. In the follicular form of the disease, however, this method is successful. Scarification of the tissue is rarely indicated, Peters's method of superficial slicing-off is not radical, and the brush in acute trachoma is very powerful, but is very destructive to neighboring tissues. Knapp's method of squeezing-out gives permanent cures; puncturing of the cartilage is to be recommended when that structure is thickened, and excision is unavoidable in localities where the epidemic is very severe. When this is carried out properly, objections to it are groundless. Good results are often obtained from the jequirity treatment when there is pannus formation. Tattooing of the borders of the lids gives good cosmetic results when the roots of the lashes are excised.

The speaker arranged his views on the following plan:

1. Both granular and follicular conjunctivitis are independent diseases caused by specific infections.

2. If there is blepharospasm, blepharophimosis, faulty position of the lashes, or disease of the lachrymal sac in a case of granulosis, these must, where possible, be eliminated.

3. The therapy of the granular process does not depend entirely upon the presented condition or the special form of the disease. External and individual circumstance must be considered.

4. The method of treatment must further depend upon whether the patient lives in an infected locality, and whether he must return to such a locality after treatment.

5. Chemical treatment can be employed only in mild cases from localities free or almost free from the disease.

6. For all graver cases, there come (*a*) the destruction of isolated granules, (*b*) the mechanical and operative methods in question.

7. The most radical mechanical method is that of expression, by compression and rolling.

8. If there is also tarsal swelling or infiltration, a free puncturing should be done first.

9. In badly infected districts, rapid and frequent recurrences develop even after the expression operation.

10. No evil consequences follow the surgical operation (when properly done) of excision of the reflected conjunctiva or the tarsus either wholly or in part.

11. In the infected districts of eastern Prussia, only radical surgical treatment has given permanent cure.

12. Most surgical and mechanical methods of treatment require later treatment with chemical agents.

4. DARIER (Paris) considered trachoma a purely local microbiotic disease, the exact cause of which is still unknown, so that at present an exact differential diagnosis between true and false conjunctivitis granulosa (trachoma and folliculosis) appears impossible. The surgical treatment is the only one which promises permanent cure, and in its employment all the diseased tissue must be destroyed by whatever means we decide upon. In isolated spots, especially in the retrotarsal fold, excision or Knapp's expression method are appropriate.

5. NENADOVIC (Hungary) gave an account of the methods usually adopted for the cure of trachoma in his country, and thought that there not much is accomplished, because the people are indifferent, and the physicians do not interest themselves because the work is largely unrenumerative. The ordinary scrubbing with sublimate solution has not been followed by permanent success. The speaker hoped for a change, from the employment of an agent which the people themselves can use, so that medical aid is required only for children and some special cases. This substance is itrol or citrate of silver, used both as a powder and in solution. The application of the powder is not painful. In one hundred and thirty cases, cure was accomplished at the latest in four months. In cases of pannus the substance does no good.

6. BLOCH demonstrated an improved spectacle frame for ptosis, by which a spring on the upper part of the bow holds the lid gently and painlessly against the brow.

AFTERNOON SESSION.

Prof. KUHNT (Königsberg), presiding.

Discussion on the subject of trachoma.—Lawrentiew (Moscow), in opposition to Hirschberg, states that some districts in Central Russia are free from trachoma. Anatomically there is no difference between follicular and trachomatous conjunctivitis, but therapeutically we must make such a difference. The cupric sulphate treatment is valuable, but iodine has not given good results. In every case the physician should keep the treatment in his own hands. In Russian military practice, Burkhardt's squeez-

ing forceps, scarification, and curetting are employed. Logetschnicow (Moscow) placed the greatest importance upon the improvement of the general constitutional and social conditions of the patients. Only in the severer cases of trachoma is the mechanico-surgical treatment appropriate, and even with it cure must not be expected at once. If cure is very rapid, the case is one of the follicular variety. Dohnberg (St. Petersburg) preferred the Russian squeezing-forceps to the roller-forceps. Germann (St. Petersburg) described his experiences with the Egyptian eye inflammation which he had seen among the Greek-Catholic scholars in Palestine. He referred to the frequent complication of trachoma with disease of the lachrymal sac, and considered the causative relation as certain. Peters spoke for the curative power of his slicing-off method in trachoma. Schmidt-Rimpler believed that the dual idea had increased, and considered it of importance in deciding the form of therapy. Mandelstamm (Kiew) is a unitarian, Mandelstamm (Riga) a dualist, and considers trachoma more a disease of the tarsus than of the conjunctiva. Upon the usefulness of the squeezing method all agreed. Blessig (St. Petersburg) and Schantz had had only unfavorable results with the itrol treatment, and in one case treated with the powder the former had seen cauterization of the cornea. With a $\frac{1}{2}$ per cent. solution there was no result, and with stronger solutions there was always irritation.

Korn (Berlin) found the galvano-caustic treatment very efficacious and not accompanied by cicatricial formation. Favorable external circumstances can sometimes afford spontaneous cure, and therefore particular attention should be directed to such things.

Chibret defended his opinion upon the influence of climate and race. Blumenthal (Riga) from an experience of two thousand cases, preferred excision of the retro-tarsal fold. Nieden saw no good effect from use of strong or weak formol solutions, so strongly recommended by Proskauer, and spoke against the premature use of new methods. Heisrath (Königsberg) accepted entirely Kuhnt's ideas and therapy, and emphasized the importance of hygienic measures. He gave an accurate description of the occurrence of trachoma in the Prussian army. Kuhnt pointed out that in the majority of cases the upper fold of conjunctival reflexion is the starting-point of the infection, and therefore excision of this part seems to offer the greatest security for radical

and permanent recovery. Even if in the beginning the difference between follicular conjunctivitis and trachoma is not clear, the treatment is the same.

1. MICHEL demonstrated the ganglion cells of the retina treated according to Weigert's method. In tabic atrophy, the ganglion-cell layer is almost entirely absent, and accordingly tabes is to be considered a peripheric affection. In albuminuric retinitis the destruction of this layer is also remarkable, while the internal and external nuclear layers show themselves but slightly altered. The change in the middle coat of the arteries shows that the initial stage of the degenerative process is there. The veins are usually partially thrombotic. Hirschberg and Schmidt-Rimpler took part in the discussion.

2. SCHMIDT-RIMPLER spoke upon the causes of detachment of the retina, and thought Leber's theory sufficient only for some cases, while in general the occurrence of the detachment was brought about by exudate in the choroid.

An increase of tension is not absolutely necessary for this condition. Two characteristic cases, in which the separation was caused by cholesterin crystals beneath the retina, were presented. These facts are important from the therapeutic point of view, but cannot be made to fit in with the method recommended by Deutschmann.

3. BELLARMINOW (St. Petersburg) gave an account of his experience in 300 cases of **tattooing** the cornea, which he had employed 1. for the cosmetic effect; 2. for optical reasons; and 3. in order to make cicatricial tissue stronger. The first reason is the most frequent, and the third the least.

Not only leucoma, but also staphyloma and atrophic shrinking of the globe, and some conjunctival affections, require tattooing. India ink, sepia, and Berlin blue may be used; aniline dyes are not permanent. A hollow needle should be used, and at a sitting we may make 700 or 800 punctures, at the rate of 100 a minute.

Hirschberg recommended the method for getting good optical results in partial displacement of the pupil, and had obtained good cosmetic effects in cataracts not suitable for operation. Nieden could not confirm any good optical results; and when cataract was present, experienced great difficulty in preventing the staining material from remaining in normal corneal epithelium.

THIRD MEETING.

Prof. HIRSCHBERG, of Berlin, presiding.

1. The subject for discussion, **The present position of the operative treatment of myopia,** was introduced by FUKALA (Vienna). He quoted from 2000 cases already reported in the literature of the subject. His method of operation was free division of the capsule and lens, and in 3 cases direct extraction was done without good result. He himself had operated upon 168 cases. Extreme myopia seemed to retard the sclerosing of the nucleus. After three to five days, or later, extraction follows. Single extraction is seldom enough. Loss of vitreous is without special importance. Disagreeable consequences, such as sticking of parts of the lens in the wound and anterior synechiæ, are easily got rid of, but cyclitic disturbance requires the greatest attention.

Eyes which are, in spite of correction for myopia, no longer useful, should be operated upon. In adults, the low limit is 10.0 D ; in children, 8.0 D ; and the operation may be done up to the age of sixty. The length of the eye before and after operation is not the same, and upon this depends the remarkable difference in refraction ; for example, Fukala found it necessary to order with 31.0 D, for distance, −2.5 D, and again, with 20.0 D, +4.0 D.

2. VACHER (Orleans) preferred extraction to discission, in adults. The limits of operability are up to fifty years, and from 12–16 D. A free corneal incision aids greatly the delivery of the lens, and iridectomy cannot be avoided. Unilateral operation should be done, and escape of the vitreous carefully guarded against. Only at the request of the patient should the second eye be operated upon. The progress of the myopia is retarded by the operation. The greatest care is necessary in the choice of cases, the determination of the degree of myopia, and in the operation and after-treatment. With a weakness of vision of $\frac{1}{10}$ and under 12.0 D, an operation should not be done. Furthermore, detachment of retina in one eye is a contra-indication to operation upon the other.

Darier gave an account of 142 cases in his practice in which in 85% a distinct improvement in vision could be shown ; in 10% vision was stationary, and in 5 % the eye was lost. This occurred three times from infectious processes; and four times from detach-

ment of the retina. Vignes had operated six times in cases of more than 15.0 D of myopia, and had never seen an improvement in vision. He had made a simple extraction and removed as much as possible of the cortical portions of the lens, and after three days had dressed the wound and removed any remaining portions. When it appeared necessary the capsule also was removed.

Pflüger attached importance to the position of the incision, on account of the possibility of future astigmatism. The chief objection to the operation is that it favors detachment of the retina, of which he saw one case; loss of vitreous and opening of the posterior part of the capsule are to be carefully avoided. The more quickly the lens swells, the better is the result to be expected. There are sometimes as a consequence opacities in the vitreous, of a certain kind hitherto not observed. The limits of the operation lie between 15 and 18 D, and unilateral operation is to be preferred. The speaker saw one case of recovery after detachment of the retina.

Blumenthal (Riga) operated upon a patient 25 years old with 16. D, and lost the eye from glaucoma and later iridocyclitis. Blessing saw in 30 cases, 3 eyes lost, twice from detachment of retina and once from iridocyclitis. Matkovic also saw in one case the previously mentioned dust-like opacities in the vitreous. Schmidt-Rimpler had operated in 12 cases with satisfactory results but wished for more exact indications for the operation, for many myopics are satisfied with glasses, and should not be subjected to the risk of operation, and furthermore in two cases increase in the myopia was noticed after the operation. Uhthoff advised against the double operation, but allowed the patient to decide. The incision should be free, since after the fiftieth year the nucleus is always present. The limit of the operation is 15 D, in children somewhat lower. Detachment of the retina is not to be considered a direct result of the operation, but loss of vitreous markedly predisposes to this, and is therefore carefully to be avoided, as well as repeated operative procedures. If there is detachment in one eye, the other should not be operated upon. Extraction of the transparent lens has usually not given the desired results. Hirschberg referred to 20 cases and emphasized certain indications. He did not operate under 15.0 D, and since detachment of the retina is the great danger, he carefully avoided loss of vitreous and repeated operation. Extraction of the trans-

parent lens offers no difficulties. Glaucoma is not a rarity, and must be considered. The operation is not new and in selected cases is to be considered. Knapp operates with his needle-knife with which a sufficient tearing can be accomplished without loss of vitreous. In 2 % of his cases he saw glaucoma which was quickly relieved by miotics or iridectomy.

Pflüger thought that improvement of vision was certain for 15.0 D ; he saw repeatedly increase in the myopia in the eye not operated upon, while the eye operated upon was not thus involved.

3. Lavogna (Monaco) spoke upon the use of the **Hydrobromate of arceolin as a miotic and in glaucoma**; it has all the good qualities of eserin, and acts more quickly. It produces extreme contraction of the pupil in ten minutes, and this remains for twenty-five minutes. It is somewhat irritant to the conjunctiva.

4. Wagner (Odessa) gave statistics in the operative treatment of **glaucoma** which, among 75,000 patients, had occurred 1227 times, or 1.6 %. In 254 cases it was absolute glaucoma, 95 times bilateral, and 159 times unilateral. Among 1227 cases, there were 466 men and 751 women ; and furthermore, 542 Christians and 685 Jews. One third the population of Odessa is Jewish, and the explanation of this predominance of the disease among them is not evident. We cannot judge by the figures whether the Slavs are specially disposed towards the disease. In accord with the principles of von Graefe, the speaker's experience was that, in the large majority of cases in which iridectomy was done early enough, the glaucoma could be considered a curable disease. Iridectomy was done 800 times, and paracentesis and sclerotomy only exceptionally employed. Early diagnosis is the prime requisite for the later successful treatment. Cocaine can be used to confirm the diagnosis, since its effects can be later removed with eserin. Permanent cure has been observed up to the thirtieth year, and Wagner himself was operated upon for acute glaucoma nineteen years ago, and retains perfectly normal vision.

In the discussion, Pflüger thought iridectomy only indicated for acute and inflammatory glaucoma, while in malignant glaucoma only should an exploratory sclerotomy be done. Purtscher was of the same opinion, and described a case in which not the performance of two iridectomies, but repeated paracentesis effected a cure. Pilocarpine sometimes causes pains in the ciliary region.

AFTERNOON SESSION.

PFLÜGER, presiding.

1. NORMAN-HANSEN (Copenhagen), speaking upon **Contusions of the eye,** gave an account of the investigations of Berlin and Hirschberg. Slight bruising may cause *œdema* fugax, without rupture of the choroid, which follows the course of the vessels to the inner layer of the retina and concentrates itself specially in the region of the macula. In more serious injuries, there are one or more ruptures frequently in the region of the macula, with bloody extravasations The rupture of vessels is often difficult to make out, and the smaller tears occur at the places where the membrane is most tightly adherent to the layers beneath it. According to the extent of the lesion, temporary or permanent disturbances of function may result.

2. MITWALSKY (Prague) observed a chronic **tarso-conjunctival** inflammation of a special form and pathological character which did not fit the picture of any inflammatory process yet described. It resembled the epithelial glandular formations, and to some extent the growths seen in spring-catarrh, and had no relation to syphilis. Microscopic preparations were demonstrated.

3. ISRAELSOHN (Smolensk) gave an account of 42 cases of **Distichiasis and trichiasis** cured by transplantation of a piece of mucous membrane from the lip. Kuhnt proceeded in the same manner, only without the use of sutures, and Matkovec had had success by the same method.

4. GERMANN (St. Petersburg) spoke upon the symptomatology, prognosis, and treatment of **orbital disease** caused by empyema of the neighboring cavities of the nose. Frontal sinus disease is the commonest cause of such disease, and disease of the ethmoid and in the antrum of Highmore is more rarely seen. In orbital phlegmon in the majority of cases discharge is usually outwards and is secondary in its nature. Among 68 cases in the last 15 years, the orbital affection was caused 12 times by tumors, 31 times by retrobulbar phlegmon without known cause, 18 times by empyema of neighboring cavities, and 7 times by injuries. In the third class, the most important secondary affections were retrobulbar neuritis, and trigeminal neuralgia. Offensive odor from the nose, especially combined with exophthalmus, is an important diagnostic indication of the presence of the exciting causes of orbital phlegmon. Position, direction of the displacement, and limitation of mobility are of importance in diagnosis,

while the subjective symptoms are not trustworthy. Energetic surgical treatment only is suitable for such cases, and consists in free evacuation of the focus of suppuration.

5. Golovin (Moscow) contributed his experiences in the surgical treatment of disease of the **frontal sinuses.** In 12 of his 17 cases he opened the frontal sinuses by a small trephine opening (1 *cm*), and in 5 cases made a large osteoplastic flap. A tube was introduced, and for half a minute the interior of the sinus was exposed to the action of superheated steam, and in a few minutes the process was repeated. In this manner the whole of the diseased mucous membrane was caused to slough, and in 5 or 6 months had completely come away. The operation lasted about 10 minutes, and gives a better cosmetic result than opening and scraping the sinuses, even if somewhat slower in its completion. The after-treatment consists in daily syringing of the cavities with a disinfecting fluid. Kuhnt mentioned his 12 recent cases, and feared that the opening made by Golovin was too small for most cases, and preferred the osteoplastic method. The process may be chiefly localized in the posterior wall of the sinus. Latent empyema promises the best results, but the diagnosis is not entirely easy. Muscular and nervous asthenopia, and a peculiar contraction of the visual field, are characteristic signs. Transitory ptosis causes a well-founded belief in the presence of frontal or ethmoidal sinus disease, without the presence of any changes in the nasal mucous membrane. When there is active inflammation the case may resemble one of glaucoma, and as a means of differential diagnosis, percussion of the bone is recommended, since in the presence of frontal sinus disease the intensity of the pain is thereby much increased. Knapp called attention to the difficulty of diagnosis of frontal sinus disease with tumor formation (sarcoma, osteoma, fibroma), and advised that the operation be proceeded with layer by layer, in order that we might know the character of the underlying tissues. In two cases he saw symptoms which pointed to the existence of empyema entirely disappear under treatment with arsenic. Pflüger had observed a case in which a brain-abscess broke into the frontal sinus.

Discussion upon the question of the therapeutic value of **subconjunctival injections** introduced by Prof. Pflüger. Prof. Reymond (Turin) in the chair.

1. Donders was the first to call attention to the action of subconjunctival injections. Rothmund employed them therapeu-

tically, and Secondi, Gallenga, and Darier followed him. Strong solutions are not to be used; strengths of 1:4000, or 1:10,000 suffice. That mercury will penetrate into the ocular tissues is not to be doubted. Other substances have likewise shown themselves active, for example, cyanide of mercury, salicylic acid, iodine trichloride, sodium salicylate, and ordinary salt solution. The greatest influence is exerted in infectious processes in the eye or cornea. In addition general medication must be attended to.

2. DARIER spoke upon the more exact indications for subconjunctival medication, which he described as one of the most fortunate and sagacious methods of medication. The mercuric chloride and cyanide used as injections have marked antiseptic and resolvent power. In the severer infectious processes from traumatism or operation, the injections form the most active means of therapeusis. In infectious corneal ulcers they afford with the galvano-caustic a rapid and sure means of saving the healthy tissue and restoring what is diseased. In cases of macular choroiditis, a few injections often restore vision promptly and cure rapidly.

3. ALONSO (Mexico) had seen in 50 cases good results. He employs the injections chiefly in 1, infectious corneal ulcers; 2, detachment of the retina; and 3, in chronic choroideal and retinal diseases.

PFLÜGER used iodine trichloride, 1:2000, 2 syringe-fuls in acute processes, and in chronic diseases he prefers iodide of sodium and sodium chloride in 2 per cent. solution. He always makes a simultaneous paracentesis by which the action of the injection is much increased. In acute choroiditis he saw excellent results, and also in cases of old choroiditis with turbidity of the vitreous; in serous iritis he advises caution. Sublimate injections appear to be indicated only in cases of sympathetic iridocyclitis. He saw detachment of the retina diminish under the use of the iodine-sodium compound, and progressive myopia seemed to be favorably influenced, and to gain in visual power under the treatment. Kuhnt, Hirschberg, Fukala, and Purtscher confirmed the good results, and Fukala had used the treatment in parenchymatous keratitis. Vignes and Adamück had no substantial successes.

Darier's injection material consisted of mercury cyanide 0.1, sodium chloride 10.0, and water 500.0, of which $\frac{1}{4}$ to 1 syringeful was injected at a distance from the cornea.

4. BELLARMINOW gave an interesting review of ophthalmological practice, as seen in the service of the Maria Society in Russia.

From the small number of oculists (only 420) in the whole of Russia, the equipment of "flying expeditions" appears to be an absolute necessity, and they have proved of the very greatest benefit. There were found among 110,298 patients examined, 385 cases of bilateral blindness (3.5 per cent.). In 3 years (1893–1896) 229 physicians found 179,623 forms of ocular disease among 114,790 individuals. Operations were done in 32,547 cases, and 8,950 cases of blindness were found, caused by trachoma, variola, other corneal affections, blennorrhœa, and glaucoma. Thirty-one permanent ophthalmological stations were founded.

Such figures spoke for themselves, and Vignes desired to offer the fullest recognition of the congress of such disinterested labor to relieve the poor inhabitants of Russia.

5. Casey Wood (Chicago) contributed his observations upon the comparative action of homatropine with cocaine and scopolamine, atropine, and duboisine in relation to their influence upon the paralysis of accommodation, and found that homatropine acted best in 2 per cent. solution in the form of disks and in combination with cocaine. Each disk contains 0.03 in equal parts, and during 1½ hours, 3 such disks may be placed in the conjunctival sac. By this process, complete paralysis of the muscle of accommodation is obtained.

6. Natanson (Moscow) gave an account of his experience with 1% **Holocaine solution,** which in every way is to be preferred to cocaine, since its action is rapid (2 – 3 *m*) and permanent (30 *m*), without pupillary dilatation, paralysis of accommodation, desiccation of the cornea, increase of tension, or dilatation of the palpebral fissure. The drug is cheaper than cocaine.

Vignes (Paris) could confirm further the favorable action of subcutaneous iodine injections (Durant's solution) in acute iridochoroiditis, about which he had already spoken at the French Congress in 1896. Especially in those affections of rheumatic origin with marked turbidity of the vitreous is this treatment appropriate, and there is a rapid diminution of all inflammatory appearances.

7. Sneguiew (Moscow), by means of vibratory massage, treated, with good result, the eye in severe forms of episcleritis, parenchymatous keratitis, and in order to ripen partial cataract. He used the Edison instrument, modified by Macklakoff. The treatment is painless, and has many advantages over manual massage, which was formerly recommended in episcleritis.

8. LAVAGNE (Monaco) had had similar rapid success with the same method in peripheral paralysis of the ocular muscles.

FOURTH MEETING.

1. The last day of the session was devoted to finishing the remaining papers, among which Reymond of Turin read one on "The Errors in the Projection of the Visual Field in Strabismus, and its Educational Treatment." He called attention to the fact that certain varieties of squint always developed double vision after operation. The cause depended upon the fact that the macula of the eye operated upon would not be used any longer for fixation, and therefore ability to use it for that purpose was lost, and it had been transferred to another portion of the retina. It is not infrequent, even after continued stereoscopic exercises, that the macula cannot be made to return to its function, and thus the double vision persists after the squint operation.

Dufour mentioned in the discussion that he was once able, in a similar case, to make out a small central scotoma, and therefore considered that the affection was a congenital one, which also influenced the occurrence of the strabismus.

2. PFLÜGER showed a patient with complete color-blindness, who was also somewhat photophobic, and saw better in a dim light.

Dor had seen several cases of the same kind, and believed the cause to be absence of the cones of the retina.

The authors and titles of the remaining papers were as follows:

3. DUFOUR; upon **Monocular double vision in accommodation.**

4. NOISCHEWSKY (Dwinsk); upon **Optical ataxia and monocular polyopia.**

5. LAVAGNE (Monaco); upon the **Treatment of strabismus from tenotomy, by the subconjunctival advancement of the antagonists.**

6. DOLGANOW (St. Petersburg); upon the **Occurrence of incurable blindness in Russia.**

7. BLUMENTHAL (Riga); notes on the **Treatment of trachomatous corneal affections, especially ulcers.**

8. KORSDRIAVZEW (Cherson); on **Hemeralopia epidemica among immigrant peasants.**

9. ELIASBERG (Riga); **A case of quinine amaurosis.**

10. GOLOVIN (Moscow); investigations upon the **Specific gravity of the aqueous humor.**

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE SECOND QUARTER OF THE YEAR 1897.

By Dr. ST. BERNHEIMER, in Vienna; Profs. C. HORSTMANN, and P. SILEX, in Berlin;

with the assistance of

Dr. S. M. Burnett, Washington; Dr. Dantone, Rome; Dr. Herrnheiser, Prague; Prof. Hirschmann, Charkow; Dr. P. von Mittelstädt, Metz; Dr. Sulzer, Paris; Dr. L. Werner, Dublin; Dr. C. H. A. Westhoff, Amsterdam; Dr. Schiötz and Dr. Ole Bull, Christiania; Drs. Greeff and Deus, Berlin; Prof. Da Gama Pinto, Lisbon; and others.

Translated by Dr. Ward A. Holden.

Sections I.–V. Reviewed by Dr. ST. BERNHEIMER.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS. STATISTICAL REPORTS.

1. Progress in Ophthalmology. *Brit. Med. Journ.*, June, 1897, p. 1554.

2. Koslowsky. Report of the Papow ophthalmic institute in Kiew for 1896. *Wjest. Ophth.*, 1897, 3.

3. Haab. Atlas and rudiments of ophthalmoscopy and ophthalmoscopic diagnosis. With 138 colored and 7 black and white illustrations. Second revised edition. Munich, 1897. Lehmann.

4. Newark Charitable Eye and Ear Infirmary. Report for the year ending Dec. 31, 1896.

5. GREEFF. The structure and ophthalmoscopic appearance of the choroid. Magnus's system of charts. Vol. xii. Breslau, 1897. J. U. Kein.

The Queen's Jubilee number of the *British Medical Journal* (1) contains papers on cataract operation, convergent strabismus, the invention of the ophthalmoscope, iridectomy for glaucoma, antisepsis, cocaine anæsthesia, and anomalies of refraction. Portraits of Sir William Bowman and Helmholtz are given.

KOSLOWSKY (2) reports on 2074 out-door patients, and on 579 who received hospital treatment. There were 666 operations, 222 of which were extractions (194 with iridectomy, a slightly modified Graefe operation; 24 without iridectomy; 2 by Woinow's method; and 2 by Pagenstecher's). Discission was done later in 19 cases. Four losses and 7 cases with imperfect results.

HIRSCHMANN.

The first edition of HAAB's (3) atlas was recognized as excellent, and the second edition is much improved by the addition of anatomical illustrations.

The number of eye cases treated at the Newark Eye and Ear Infirmary (4) during 1896 was 4127. There were 708 operations on the eye, including 49 operations for cataract; 18 without iridectomy, 10 with. BURNETT.

GREEFF's (5) schematic section through the choroid, with the three corresponding ophthalmoscopic pictures, forms a welcome addition to the well-known series of charts issued by Magnus.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

6. FORMAGET and LAFFAY. Experimental researches on the action of subconjunctival injections of cyanide of mercury in suppurations of the eyeball. *Soc. d'anat. et de physiol. de Bordeaux*, Feb. 18, 1897.

7. PANAS. The rôle of auto-infection in eye diseases. *Arch. d'opht.*, xvii., 5, p. 273.

8. CHALUPECKY. On the action of the Roentgen rays on the eye. *Zeitschr. der tschech. Aerzte*, 1897, No. 25.

9. OSTWALT. The means of preventing post-operative infection. *Soc. franç. d'opht.*, 1897. *Annal. d'ocul.*, cxvii., p. 364.

10. GINSBERG. On an ocular affection resembling tuberculosis, with acid-resisting bacilli. *Centralbl. f. prakt. Augenheilk.*, 1897, p. 131.

11. DUANE. Significance of the corneal reflex in diagnosticating posterior polar opacities. *Ophth. Record*, June, 1897.

FORMAGET and LAFFAY (6) report the following experiment: On February 4th both corneas of a rabbit were inoculated with a pure culture of staphylococcus two days old. The following day both eyes showed a mild purulent keratitis, a corneal abscess the size of a pin-head extending into the anterior chamber, considerable hypopyon, discoloration of the iris, and exudation in the pupil. The right eye was left to its fate, while ¼ of 1 *ccm* of a 1 per cent. cyanide-of-mercury solution was injected beneath the conjunctiva of the left. On February 8th the corneal ulcer in the right eye was found to have extended, and a ciliary staphyloma which had developed burst in the course of the examination. In the left eye the corneal process had improved, and the hypopyon disappeared two days later. On February 15th the right cornea had sloughed, while in the left eye every sign of suppuration had disappeared, and a white spot in the cloudy cornea indicated the point of inoculation. SULZER.

Auto-infection of the eye, which PANAS (7) holds accountable for the greater number of the inflammatory, no less than the non-inflammatory, affections of the eye, consists in the infection of the eye through the circulation, by germs, toxins, or actual poisons like tobacco or alcohol, entering the body, or by excretory matters from the organs not being eliminated from the system. All factors lessening the body's resistance favor infection. Panas speaks particularly of the metastatic affections arising from disease of the female genital organs. Every infectious focus in the body may—particularly in general diseases, chlorosis, and functional disturbances of various organs—give rise to affections of the uveal tract and retina. The effect of disease of neighboring parts is also taken into consideration. Whether sympathetic ophthalmia be due to germs or to toxins is still an open question. But just as an eye artificially irritated may become infected with pathogenic germs from some distant focus of infection in the body, so when an injured eye causes a vaso-motor excitation in the other eye, this second eye may become infected equally well by an infective agent from the first eye, as by one from some other portion of the body. If infection does not take place, there is only a sympathetic neurosis. V. MITTELSTÄDT.

CHALUPECKY (8) endeavored to ascertain experimentally the effect of the Roentgen rays upon the eye. A rabbit was exposed

to a lamp of 12 to 16 ampères, at a distance of 10 *cm*, two hours daily. Up to the 13th hour of exposure no ill effects were noted excepting miosis and lachrymation. Then the hair in the region of the eye and cheek began to fall out, and a conjunctivitis developed, resembling a diphtheritic process. The other side of the head was not affected. The Roentgen rays like the ultraviolet rays affect strongly the anterior portion of the ball, while they are absorbed in considerable measure by the inner media, including the lens. HERRNHEISER.

Experiments on rabbits have convinced OSTWALT (9) that the introduction into the anterior chamber of a pastille containing 25 *mg* of iodoform will check a staphylococcus infection which will destroy the other eye similarly inoculated. SULZER.

GINSBERG (10) reports in detail on two cases seen in Hirschberg's clinic, which clinically had not the appearances of tuberculosis. The anatomical examination, however, revealed an apparent tuberculosis and the presence of bacilli differing morphologically from tubercle bacilli but possessing the resistance to acid which was thought to be possessed by the tubercle bacillus alone. Gram's method could not be used because the specimens had been hardened in Müller's fluid. It is expressly stated that the rod had no resemblance to the bacillus of Lustgarten (smegma, syphilis?).

DUANE (11), in this paper, shows by diagrammatic figures what is practically well known, though it has been explained erroneously, that a posterior lenticular opacity always coincides with the corneal reflex as seen through the ophthalmoscopic mirror, no matter in what direction the eye is rotated. In the same number of this Journal there are communications on the same subject of similar import by Jackson and Weiland.

BURNETT.

III.—INSTRUMENTS AND REMEDIES.

12. SIMI. Subconjunctival injections of sublimate. *Boll. d'ocul.*, xviii., 16, p. 122.

13. NICODEMI. A contribution to the indications, the technique and case histories of exenteratio bulbi. *Arch. di Ottalm.*, vi., 7–10, pp. 225 and 308.

14. ANGELUCCI. Intravenous injections of bichloride of mercury in ocular syphilis. *Ibid.*, 9–10, p. 296.

15. ANGELUCCI. A new case of choked disc from a cerebellar and paracerebellar focus cured by craniotomy. *Ibid.*, 7–8, p. 209.

16. VÁMOSSY ZOLTNU. Anæsine, a new local anæsthetic *Ungar. med. Presse*, 1897, No. 21.

17. DENEFFE. On holocaine in ophthalmic therapeutics. *Ann. d'ocul.*, cxviii., p. 289.

18. HEINZ. On the action of holocaine. *Centralbl. f. prakt. Augenh.*, xxxiv., p. 85.

19. HEINZ and SCHLÖSSER. Holocaine, a new anæsthetic. *Zehender's klin. Monatshl*, xxxiv., p. 114.

20. HIRSCHFELD. A new anæsthetic. *Ibid.*, p. 154.

21. WINSELMANN. On holocaine. *Ibid.*, p. 150.

22. DERBY, HASKET. The new local anæsthetic holocaine. *Boston Med. and Surg. Journ.*, June 3, 1897.

23. JACKSON. A modification of the sight-hole of the ophthalmoscopic mirror. *Ophthal. Record*, June, 1897.

24. KOLLOCK. A case of optic-nerve atrophy treated by inhalations of nitrite of amyl. *Ibid.*, May, 1897.

SIMI (12), who has not been satisfied with the results of subconjunctival injections on a number of patients, describes the results of several series of experiments on dogs, rabbits, and guinea-pigs, by Carvatola and Alessandro in Messina. They found that sublimate in the form of subconjunctival injections has no antiseptic action, since it is quickly transformed into an albuminate of mercury which has no antiseptic properties. The traumatic and chemical action brings about at times more severe, injurious tissue changes than are caused by the disease for the cure of which the injections are given. DANTONE.

NICODEMI (13) on the ground of 89 exenterations done by Manfredi in Pisa for panophthalmitis, total corneal staphyloma, kerato-iritis with total destruction of the cornea, phthisis of the ball, buphthalmus, and hemorrhagic glaucoma, speaks of the advantages of this operation over enucleation, which is only indicated when a tumor is present, or there is sympathetic ophthalmia, or when a foreign body lies in a shrunken and painful ball. The operation is simple and without danger, and local anæsthesia is usually sufficient. The course of recovery averaged 13 days. For removing the contents of the ball, Manfredi does not use the spoon but a wad of hydrophilous gauze which is used either dry or after being dipped in mercuric bichloride solution. DANTONE.

ANGELUCCI (14), in opposition to Galezowski, defends the intra-

venous injection of bichloride for the rapid treatment of ocular affections of syphilitic origin, and speaks particularly of the innocence of the procedure and its unexpectedly rapid results. In recent years the author has made 299 injections of this sort in 30 patients, and as many as 19 in a single person; 0.2—0.4% solutions are used, and with each injection 0.004—0.014 bichloride is introduced into the venous current. DANTONE.

ANGELUCCI (15) reports a further case of choked disc dependent upon an intracranial neoplasm or focus of inflammation, which, after the reduction of intracranial pressure by trephining, partially passed off. The patient, a woman of 31, had suffered for a year with various nervous symptoms, when sight began to fail, until finally the right eye became blind and vision in the left was reduced to $\frac{1}{12}$. The diagnosis of brain tumor was made, the left occipital region was trephined, the dura divided, and an incision made into the presenting lobule of the cerebellum. The symptoms remained stationary for a time, but four months after the operation the swelling of the disc was much diminished and the vision of the left eye still was $\frac{1}{36}$. DANTONE.

VÁMOSSY (16) reports on a new local anæsthetic called anæsine. A 10% aqueous solution has the effect of a 2½% solution of cocaine. He places the drug, which causes no symptoms of irritation or of toxic action, and whose solutions remain sterile, high above cocaine in value. Further experiments should be made.

HERRNHEISER.

With a 1% solution of holocaine dropped into the eye three times at intervals of a minute DENEFFE (17) obtained complete anæsthesia of the cornea and conjunctiva. Holocaine does not cause pain, mydriasis, contraction of the vessels, or paralysis of accommodation. Its action is constant and Deneffe believes that it will take the place of cocaine and eucaine in ophthalmology.

SULZER.

HEINZ and SCHLÖSSER (19) have made many experiments with holocaine, and prefer it to cocaine. It has antiseptic qualities, acts quickly, and appears not to be followed by toxic symptoms.

HIRSCHFELD'S (20) experiments showed that 1% solutions of holocaine equal in effect 2% solutions of cocaine and never give rise to toxic symptoms.

DERBY (22) has been experimenting with the new anæsthetic, holocaine, and has used it in 6 operative cases and 10 others. He finds it satisfactory in its action, the anæsthesia being rapid, ex-

cept in one case where it was used for expression in trachoma, when anæsthesia did not come on for over 7 minutes.

BURNETT.

In order to avoid the annoying reflection from the sight-hole of the ophthalmoscopic mirror JACKSON (23) has a thin "film" of glass cemented to the back of the hole and covering it. If the mirror is concave, the piece at the back must be convex.

BURNETT.

KOLLOCK's (24) case was one of unilateral atrophy (right), without assignable cause in a man of 63, who was a smoker and drinker but not to excess.— V $\frac{1}{10}$ after correction. — Inhalation of nitrite of amyl increased the calibre of the retinal vessels as seen by the ophthalmoscope, and vision was advanced after several seances and has remained permanently increased to $\frac{6}{30}$. The visual fields were also enlarged. BURNETT.

IV.—ANATOMY.

25. BIETTI. A contribution to the study of the elastic tissue of the eye. *Arch. di Ottalm.*, iv., 7–8, p. 217.

26. BIETTI. On the distribution and termination of the nerve fibres in the ciliary body. *Ann. di Ottalm.*, xxvi., 3, p. 215.

27. CAPELLINI. The nerves of the cornea demonstrated by Golgi's method. *Arch. di Ottalm.*, iv., 11–12, p. 352.

28. PASSERA. The recurrent arteries of the choroid and their relations with the vascular network, the chorio-capillaris. *Ricerche nel Lab. di an. norm. della R. Univ. di Roma*, vi., 1, p. 29.

29. LASSAY. Anastamosis between the nasal and lachrymal nerves ; an anamoly of the ophthalmic ganglion. *Soc. d'anat. et de physiol. de Bordeaux*, May 3, 1897.

According to BIETTI (25), who treated his specimens with nitrate of silver, following the method of Tartuferi and Martinotti, elastic tissue is present in the eye in greater quantity than other observers have found it and other methods of preparation have revealed it. Thick longitudinal and finer intermediate tracts surround in a network all the nerve fibrillæ, the walls of the central vessels, and the fibres of the lamina cribrosa. DANTONE.

BIETTI (26) has found, by using the rapid Golgi method on the eyes of a four–five months' human fœtus, that the nerve fibres end in the ciliary body in three ways : 1, with fine terminal arbor-

izations; 2, with a wide-meshed fibre network, which pervades the entire ciliary body; and 3, in a nervous plexus at the outer margin between ciliary body and choroid. DANTONE.

CAPELLINI (27) has treated the corneas of various animals by means of Golgi's method, and has obtained the most surprising preparations showing clearly the position, course, and relations of the nerve fibrillæ. DANTONE.

PASSERA (28) describes the origin, course, and manner of branching of the recurrent arteries of the choroid as shown in his injected specimens. The relation of these arteries to the capillaries of the chorio-capillaris had not previously been made out. While these capillaries in their distribution cover the inner side of the larger arteries and veins of the choroid, they bend back a the walls of the recurrent arteries.

V.—PHYSIOLOGY.

30. HESS. Studies on accommodation. III. Change of position of the human lens during accommodation and its measurement, together with contributions to the theory of accommodation. *Graefe's Archiv*, xliii., 3, p. 477.

31. BERLIN, EHRENFRIED. On the determination of the total refractive index in the living eye. *Ibid.*, xliii., 2, p. 287.

32. BERNHEIMER. Experimental investigations on location in the nuclear region of the oculo-motor nerve. *Offic. Proto. d. K. K. Ges. d. Aerz. in Wien*, March 26, 1897. *Weiner Klin. Wochenschr.*, No. 13, 1897.

33. UHTHOFF. Further contributions to the subject of the learning to see by persons born blind and afterwards operated upon, and also to the rare occurrence of forgetting how to see by young children, with psychological remarks on total congenital amaurosis. *Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xiv., 3–4, p. 197.

34. SIETHOFF. The explanation of Seemann's entoptic phenomenon. *Ibid.*, xiv., 5, p. 375.

35. ABELSDORFF. The ophthalmoscopic recognition of the visual purple. *Ibid.*, xiv., p. 77.

In continuation of his previous report (*Graefe's Archiv*, xlii., 1, p. 288) HESS (30) offers new proofs of his belief that the displacement of the lens during the contraction of the ciliary muscle

is a passive affair caused by the weight of the lens. Thus, in violent accommodative efforts, he found that the lens, from its weight, sinks down. According to the position of the head the lens in accommodation sinks toward the corresponding portion of the ciliary body.

When the iris lies in a horizontal plane, no lateral movement of the lens is seen.

The contraction of the ciliary muscle caused by eserine is more extensive than the contraction caused by the greatest accommodative impulse. In the author's eye during accommodation the lens sank downward 0.3 to 0.35 *mm.* Turning the head from the right shoulder to the left doubled the lateral excursion of the lens. With the zonula relaxed, the lens lies nearer the cornea when the head is bent forward than when it is thrown back. Therefore, with the head bent forward, the range of accommodation is greater.

BERLIN (31) determined with the ophthalmometer the location of the posterior surface of the lens and its reflex, and sought in this way, by computation, to find the total refractive index of the living lens, and thus the optic constants of an individual eye without the aid of schematic values.

The figure 1.4451 for the total refractive index corresponds closely to the figures Helmholtz found for two dead lenses, namely, 1.4519 and 1.4414, and differ but slightly from the 1.4384 found by Mathiessen in another way.

Having found the lens index, all the optic constants of the measured eye were computed, and were found to agree with those of the schematic eyes of Listing and Helmholtz, and with those of the actual eyes hitherto examined.

BERNHEIMER (32), by experimental investigations on monkeys, confirmed his views, already published by Bergmann in monograph form, on the region of the oculo-motor nuclei in man. He demonstrated a series of preparations stained by Nissl's method, which show that the intrinsic muscles of the eye are supplied from what he has called the accessory nucleus of the oculomotor, the fibres crossing. The ciliary ganglion is not to be regarded as the primary centre for pupillary reaction. Further details will appear in later publications.

UHTHOFF'S (33) patient was a boy of five, operated on for bilateral, congenital, complete cataract. On him, as on earlier patients, Uhthoff carefully studied the mental condition while

the child was learning to see. This interesting paper must be read in full to be appreciated.

In vol. vi. of the *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, Seemann described an entoptic phenomenon, namely, when in a dark room one looks through a slit in a dark screen at a source of illumination that is not too intense, one sees clear violet lines of light arranged in a pear-shaped figure. SIETHOFF (34) regards this appearance as the entoptic complementary after-image of the fovea, caused by the excitation of the percipient cones lying behind the macular region. The lines of light are supposed to correspond to the elevated upper and lower margins of the macula, which are colored with the yellow macular pigment.

ABELSDORFF (35) examined with the ophthalmoscope and a strong light the eyes of fishes which had been kept for several hours in a dark room. The upper two-thirds of the fundus, in the region of the tapetum, had a red color, while the lower third of the fundus, where only the pigment epithelium is present, was of a grayish color. With the illumination of the eyes the red of the upper portion of the fundus vanished, but after remaining an hour in the dark this visual purple reappeared.

Sections VI.–XI. Reviewed by PROF. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

36. BULL. The visual effects of errors of refraction. *Arch. d'opht.*, xvii., 4, p. 232 (*cf.* p. 606, preceding number of these ARCHIVES).

37. SEGGEL. On the effect of the illumination on the acuteness of vision and the development of myopia. *Münchener med. Wochenschr.*, 1897, Nos. 37 and 38.

38. DOR. On the full correction of myopia. *Ann. d'ocul.*, cxvii., p. 356.

39. HIPPEL. On the operative treatment of high myopia. *Deutsche med. Wochenschr.*, 1897, No. 25.

40. DISTLER. On the operative treatment of high myopia. *Med. Corr.-Bl. des Württemberg'shen Aerztl. Landes.*, 1897, No. 27.

41. HESS. New advances in the operative treatment of high myopia. *Zeitschr. f. prakt. Med.*, 1897, No. 114.

42. GELPKE and BIHLER. The operative treatment of myopia. *Beitr. z. Augenheil.*, xxviii., p. 1.

43. Dransart. Third contribution to the surgical treatment of progressive myopia by iridectomy and sclerotomy. *Ann. d'ocul.*, cxvii., p. 357.

44. Vacher. On the extraction of the healthy lens as a prophylactic measure and in the treatment of progressive myopia of high degree. *Clin. Ophthal.*, 1898, No. 8.

45. Carhart, W. M. D. The refraction of the eyes of 1000 school children, with special reference to astigmatism, as shown by the ophthalmometer of Javal. *N. Y. Med. Jour.*, April, 1897.

46. Reynolds, D. S. Astigmatism. *Jour. Amer. Med. Assoc.*, May 29, 1897.

Seggel (37) has found that the number of scholars who become myopic increases up to the sixteenth year, and after that decreases. In the higher classes it is only exceptionally that a pupil becomes myopic. In the newer buildings, which are better lighted, the number of myopes was less and their acuteness of vision was better than that of those in poorly lighted schools.

v. Hippel (39) has done discission for myopia in 114 cases. According to his idea the myopia must be at least 12. D, and the patient must be unable to pursue his ordinary vocation with the aid of glasses. He prefers operating on both eyes in order to obtain binocular vision. Subsequent detachment of the retina, according to Hippel, does not depend upon the operation. He believes the progress of the myopia to be diminished by the operation, but it does not prevent the development of choroiditis and detachment of the retina.

According to Distler (40) the operative treatment of high myopia is almost without danger. The acuteness of vision is improved, and possibly binocular vision is restored. Loss of accommodation is not a serious disadvantage. The danger of hemorrhage or detachment is not lessened by the operation, nor is it increased.

Hess (41), for the treatment of myopia, operates by means of the peripheric linear section, lacerating the anterior capsule of the lens with the point of the lance-shaped knife.

Gelpke and Bihler (42) operate on every myope whose vision cannot be improved sufficiently with glasses. They have operated on 74 eyes, with bad results in 3.4 per cent. The average increase in acuteness of vision was five-fold.

In these examinations, Carhart (45) found 13.90% E., 36% H., 44% comp. H. astig., 1.48% M., 3.50% comp. M. astig., 1% mixed

astig. He suggests the following conclusions. Distention of the eye as a whole is caused by strain of accommodation in a healthy eye or the physiological use of a weakened eye. This distention is also associated with a change in the corneal curve. H. astig. may be congenital, but the myopic and mixed forms are due to lengthening of the eyeball. BURNETT.

REYNOLDS (46) reports statistically on an examination of 4686 ametropes. All examined under a mydriatic, homatropine mostly, which he considers perfectly reliable. There was only spherical error in 3450 of these cases, the rest, 1291, mere astigmatism. Of these, the astigmatism was H. in both eyes in 380; comp. H. in both in 250; H. in one eye only, 232; comp. H. in one, 185; mixed astigmatism in both, 54; in one, 37. M. astigmatism in both, 76; comp. M. in both, 89; M. in one, 44; comp. M. in one, 57. Four had H. astigmatism in one, and M. astigmatism in the other. The axes were oblique in 206; different in the two eyes, 154. Astigmatism in one eye only, 555. For asthenopia he attends to the general condition as well as the optical error in debilitated individuals. BURNETT.

VII.—LIDS.

47. PERGENS. Favus of the eyelids. *Zehender's klin. Monatsbl.*, xxxiv., p. 241.

48. KOHANN. On the entropium operation. *Wjest. Ophth.*, xiv., 2, 3.

49. HELMBOLD. The operation for ectropium of the lower lid. *Zehender's klin. Monatsbl.*, xxxiv., p. 203.

50. MOTAIS. New operation for ptosis. *Ann. d'ocul.*, cxvii., p. 367.

51. GOLDZIEHER. Demonstration of a case of ptosis amyotrophica. *Ungar. med. Presse*, 1897, No. 21.

52. GOMEZ. A case of unilateral epicanthus. *N. Y. Med. Journ.*, 1897, April 17.

KOHANN'S (48) operation for entropium is done as follows: 1. With scissors two vertical cuts are made through the entire thickness of the lid 3–4 *mm* long, one cut being made at the outer angle of the lid, the other just external to the lachrymal punctum. 2. The lid is then everted, and on a horn spatula the two vertical incisions are united at their ends by a transverse incision passing through the conjunctiva and tarsus. Above and below this trans-

verse incision the muscular layer is carefully separated from the tarsus, care being taken not to injure the skin. 3. The lid is now brought back into normal position and supported by the horn spatula, while the vertical incisions are prolonged 7–10 *mm* (upward in the case of the upper lid) through the skin and superficial muscular layer. The lid margin is now turned out so that the lashes point upward. 4. Three vertical sutures are introduced as follows: The needle enters the conjunctiva 1 *mm* behind the posterior edge of the free margin of the lid, and is passed directly through the tarsus, and then upward between the tarsus and muscular layer of the upper portion of the lid, emerging through the skin 3–4 *mm* below the brow. When knotted the free margin of the lid is turned outward. The vertical incisions are now united each by means of three sutures. The middle suture is passed through the skin and tarsus just below the lashes 4 *mm* from the margin of the incision, and then passed through the entire thickness of the other wall of the incision 3–4 *mm* higher up. The upper and lower sutures are more superficial, but are to be carefully applied so that no incurving of the lid-margin is produced. The operation is concluded by dividing the outer commissure. This operation is recommended for cases with curving of the cartilage of the upper lid.

Motais (50) endeavors to obviate the defect of the ptosis operations now employed by the following procedure: A bundle of fibres is loosened from the middle of the tendon of the superior rectus, and sewed to the middle of the upper margin of the tarsus and its anterior surface. The parts are reached by means of an incision through the retrotarsal fold while the upper lid is completely ectropionized. The excision of a flap of skin completes the operation.

The peculiar features of Gomez's (52) case were that the epicanthus was unilateral, and that it was due to scleroderma. The deformity was relieved by operation. Burnett.

VIII.—LACHRYMAL APPARATUS.

53. Fikinadte. Some cases from practice. *Wjest. Ophth.*, 1897, No. 2.

54. Dörnig. A case of acute dacryoadenitis. *Inaug. Dissert.*, Greifswald, 1897.

55. Lodato. Primary tuberculosis of the lachrymal gland. *Arch. di Ottalm.*, iv., 11, 12, p. 383.

56. JENNINGS. A case of cirrhotic carcinoma of the orbital lachrymal gland. *Amer. Journ. of Ophth.*, April, 1897.

57. FISCHER. A concretion in the canaliculus. *Centralbl. f. prakt. Augenheilk.*, xxi., p. 207.

FIKINADTE (53) records a case of tuberculous inflammation of the lachrymal gland following trauma, in a girl of fifteen.

HIRSCHMANN.

LODATO (55) reports on a tumor of the lachrymal gland extirpated by Angelucci, which had developed within a relatively short time. Tubercles were found in the degenerated acini of the gland. Since tuberculosis was not found elsewhere in the body, this was thought to be a case of primary tuberculous infection of the gland. DANTONE.

The patient from whom JENNINGS (56) removed the lachrymal gland was a woman of forty-five, who had noticed exophthalmus of the right eye twelve years before, which had gradually increased. When examined R v = $\frac{2}{60}$; ocular movements good. A hard tumor was felt in the upper part of the orbit. The disc was dull gray and surrounded by a patch of choroidal atrophy. The tumor in its capsule was readily removed from the surrounding tissues. It proved to be a scirrhus-carcinoma of the orbital portion of the gland. It was one and a half inches long by one inch thick, with a dense capsule. Glandular remains were still present. BURNETT.

FISCHER (57) removed from the lower canaliculus of an old man a stony concretion as large as a pea, which was composed of magnesium salts.

IX.—MUSCLES AND NERVES.

58. SACHS. On the vision of strabismus patients. *Graefe's Archiv*, xliii., 3, p. 597.

59. WARRINGTON, W. R. A case of congenital double abducens and right-sided facial paralysis. *Ophth. Rev.*, xvi., p. 99.

60. THOMPSON. A case of loss of conjugate movement of the eyes to either side. Almost complete recovery. *Ibid.*, p. 102.

61. KUNN. On spasm of ocular muscles in athetosis. *Deutsche med. Wochenschr.*, 1897, No. 24.

62. KUNN. On spasm of ocular muscles in tetanus. *Ibid.*, No. 26.

63. HAUPTMANN. A case of progressive traumatic paralysis of the III.–VII. cranial nerves. *Inaug. Dissert.*, Greifswald, 1897.

64. HUBBELL. Ocular palsies from injury. *Ophth. Record*, April, 1897.

65. WOODRUFF. A case of binocular diplopia with monocular diplopia in each eye. *Ibid.*, June, 1897.

In WARRINGTON'S (59) case there was complete congenital paralysis of both externi, and also a right-sided paralysis of the facial muscles, with the exception of the orbicularis and the muscles of the forehead. WERNER.

THOMPSON'S (60) patient was a healthy man of fifty-five, who suddenly lost the power of moving the eyes laterally, while the power of convergence remained intact. The knee-jerk was exaggerated. Five weeks later the interni had completely regained their function, and eleven weeks later the externi, partially. A permanent weakness of the left externus remained, however. WERNER.

After a trauma, KUNN'S (61) patient, when he looked up, was not able to look down again for eight or ten seconds. If, when looking straight forward, he was asked to look down quickly, the result was as before. He blinked in a strained fashion, and often a spasm came on which drew the eyes up and to the right instead of down. This was a pure spasm of the extrinsic muscles consisting in slow tonic contractions.

In tetanus, KUNN (62) observed spasms of the extrinsic and intrinsic ocular muscles; one eye assumed a convergent position, and the patient had no power to change it. The pupil and the ciliary muscle contracted, the conjunctiva became red, the upper lids drooped and presented an obstacle to their passive elevation. When the attack was over the conditions again became normal.

In a laborer of forty-two, kicked on the left cheek by a horse, HAUPTMANN (63) saw first paralysis of the sensory branches of the left trigeminus, then of the abducens, later of the oculo-motor and trochlear, and finally of the facial nerve itself. The cause was supposed to be a fracture of the base with consecutive formation of a large callus.

In the first of HUBBELL'S (64) cases a man's head was squeezed between two beams, causing immediate unconsciousness. There was paralysis of the facial and abducens on both sides. Slow improvement took place, the left abducens regaining nearly the

whole of its power: the right slightly improved. Facials also improved. The other case was one of total monocular ophthalmoplegia externa and interna from a punch in the eye with an umbrella stick. Vision was lost, the optic discs pale, and there was an exophthalmus. BURNETT.

In the interesting case given with much detail by WOODRUFF (65), a highly myopic woman of fifty-six had a binocular diplopia due to a paresis of the superior rectus of the left eye, and a monocular diplopia of each due to a central opacity of the corneæ. The variation in the size of the pupils under different degrees of illumination gave rise to various phenomena in these double images and in reading, etc. BURNETT.

X.—ORBIT AND NEIGHBORING CAVITIES.

66. VAN DUYSE and MOYART. Bilocular meningo-encephalocele of the orbit with exclusion of the distal sac. *Arch. d'opht.*, xvii., 6, p. 363.

67. STEINER. Two cases of cystic dilatation of bony cavities at the entrance of the orbit. *Centralbl. f. prakt. Augenheilk.*, 1897, p. 161.

68. SACHSALBER. On plexiform neuroma of the orbit with secondary buphthalmus. *Beitr. z. Augenheilk.*, xxvii., p. 1.

69. TRZEBISKY. Rare locations of dermoid cysts. *Wiener med. Wochenschr.*, 1897, No. 10.

70. RADSWITZKY. A case of enophthalmus alternating with exophthalmus. *Med. Obosrenie*, 1897, No. 5.

71. CRAMER. Injuries of the orbit. *Monatsschr. f. Unfallskunde*, 1897.

72. POOLEY. Ethmoidal disease, its ophthalmological symptoms. *Amer. Journ. of Ophth.*, April, 1897.

73. SATTLER, ROBERT. Sarcoma of the orbit. *Ophth. Record*, June, 1897.

VAN DUYSE and MOYART (66) observed, in an infant of six weeks, a congenital hard tumor under the inner-upper margin of the left orbit, pushing the eye forward and outward. The tumor presented none of the characteristic symptoms of meningocele, and by its rapid growth threatened the eye. When cut down upon, a tough white cyst-wall was found, which, when divided, collapsed after giving exit to a clear, watery liquid. Internal to

this cyst was a much smaller one, from which great quantities of cerebro-spinal fluid were withdrawn by aspiration, showing its connection with the cranial cavity. This case, then, was one of meningo-encephalocele consisting of two segments, the outer one cut off, the inner still in connection with the brain. The infant recovered. v. MITTELSTÄDT.

STEINER'S (67) case consisted of a cystic dilatation of the frontal sinus, and of a mucous cyst in the region of the sphenoid.

SACHSALBER (68) reports on a case of plexiform neuroma of the orbit with secondary buphthalmus in a boy of seven. Exenteration of the orbit was done, and he gives the results of the anatomical examination of the tumor and of the eyeball.

TRZEBISKY (69) removed from a girl of four a dermoid of the orbit as large as a hazel-nut, which pushed the eyeball down and in, and caused moderate exophthalmus.

In RADSWITZKY'S (70) patient, a woman of twenty-two, the left palpebral fissure was a little lower than the right. Lateral mobility of the left eye was diminished, and the left eye lay 2 or 3 *mm* deeper in the orbit than the right. When the patient reclined the ball sank back deeper into the orbit. When the patient leaned forward, or exerted herself excessively, or when the jugular was compressed, a marked exophthalmus occurred. The cause was thought to be a dilatation of the retrobulbar veins.

HIRSCHMANN.

The case which is the basis of POOLEY'S (72) paper, dealing with the subject of ethmoid tumors generally, was that of a young girl of twelve years, who came with a hard swelling in the upper-inner region of the right orbit reaching below the lig. canth. inter. In this there was a small fistulous opening, which, when opened, and the cavity explored, led to an enlarged ethmoid, from which granulative material mingled with pus escaped when the wall was broken down with a probe. A soft silver style was inserted, and the cavity washed out daily with carbolized water. In three weeks the wound had firmly closed, though a note says there was a slight relapse afterwards. BURNETT.

SATTLER (73) protests against operative interference in cases of sarcoma of any of the tissues of the orbit, as an operation always hastens their development. In support of this he offers the following cases: Case I. Subperiosteal pulsating sarcoma in the floor of the left orbit of a child of nine; rapid growth; duration six months; death; metastatic deposits in brain, cerebellum, and

internal organs. In this case, removal of orbital contents was quickly followed by a recurrence of the growth. Case II. Large subperiosteal myeloid sarcoma of the inner wall and roof of the orbit. Death in six months after first local manifestation. Case III. Girl of three and one-half years. Tumor completely filling the orbital cavity. Eye removed. Child died four weeks later. Case IV. Large tumor (sarcoma ?) of right orbit. Duration three months. No operation. Metastasis to brain and internal organs. CaseV. Encapsulated (?), soft, round-celled sarcoma in floor and apex of orbit in a girl of four years. Great protrusion. Operative exenteration of the orbit. Recovery. Case VI. Subperiosteal alveolar round-celled sarcoma. Slow growth, exploratory operation. Death in three and one-half years. Case VII. Enormous osteo-sarcoma of left orbit. No operation. Death. Duration six years. Patient aged sixty-two. Case VIII. Osteo-sarcoma of the walls of the orbit; enucleation and exenteration. Tumor slowly returned, but patient disappeared from observation.

BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

74. MORAX. The microscopic diagnosis of conjunctivitis. *Ann. d'ocul.*, cxvii., p. 361.

75. ANGÉRAS. Microscopic examination of conjunctival secretions from a clinical point of view. *Ibid.*, p. 365.

76. BELILOWSKI. Ophthalmological observations. *Wjest. Ophth.*, 1897, No. 3.

77. WEICHSELBAUM and ADLER. An epidemic of acute conjunctivitis in Lower Austria. *Oesterreichesches Sanitätswesen*, 1897, No. 20.

78. COPPEZ. Contribution to the study of pseudo-membranous conjunctivitis. *Arch. d'opht.*, xvii., 5, p. 314.

79. PETERS. On the relation of the xerosis bacillus to the diphtheria bacillus, with remarks on croupous conjunctivitis. *Deutsche med. Wochenschr.*, 1897, No. 9.

80. PETERS. On chronic conjunctivitis from diplo-bacilli. *Zehender's klin. Monatsbl.*, xxxiv., p. 181.

81. AXENFELD. Further experiences with chronic conjunctivitis from diplo-bacilli. *Berl. klin. Wochenschr.*, 1897, No. 39.

82. HIRSCH. The manner of distribution of trachoma in the industrial regions of the Rhine and Westphalia. *Graefe's Archiv*, xliii., p. 706.

83. KUHNT. On the treatment of trachoma. *Deutsche med. Wochenschr.*, 1897, No. 38.

84. ELSCHNIG. Syphilitic infiltration of the bulbar conjunctiva. *Zehender's klin. Monatsbl.*, xxxiv., p. 155.

85. GARNIER. Pterygium and the operations for its relief. *Wjest. Ophth.*, xiv., 3, p. 221.

86. BRENNECKE. The streptococcus pyogenes the cause of diphtheritic conjunctivitis in a case of measles. *Journ. Amer. Med. Assoc.*, June 26, 1897.

The comprehensive paper by MORAX (74) deserves to be read in full, and here only a few practical points in regard to the examination of diphtheritic conjunctivitis will be mentioned. When, in this disease, cultures on serum are alone studied without a previous microscopical examination of the conjunctival secretion, great difficulties are met with. Both in the normal and the diseased conjunctiva bacilli are found, which are so few, however, as not to disturb the microscopic examination, but which in serum cultures largely predominate. The colonies resemble those of the virulent diphtheria bacillus, therefore the inoculation of guinea-pigs is necessary to establish the diagnosis, and this requires from four to seven days. This is a serious disadvantage. In cover-glass preparations of conjunctival secretion the diphtheria bacilli are easily recognized by their irregular form. SULZER.

BELILOWSKY (76) describes an epidemic of conjunctivitis, fifteen cases. He describes also conjunctivitis catarrhalis nivalis accompanying snow-blindness. He observed hemeralopia, conjunctival catarrh on the third or fourth day, ophthalmoscopically small irregular spots in the macular region, and slight hyperæmia of the retina in railroad employés working in cold snowy weather.

The observations of ADLER and WEICHSELBAUM (77) agree with those of Axenfeld in regard to the epidemic the latter observed in the neighborhood of Magdeburg. Since pneumococcus-conjunctivitis requires much less rigid prophylactic and therapeutic measures than some other infectious conjunctival catarrhs, an early bacteriological examination is desirable. HERRNHEISER.

COPPEZ (78) shows the inaccuracy of the claim by Sourdille and Valude, that Bouisson, in 1846, first described a benign pseudo-membranous conjunctivitis, and that Chassaignac had described pseudo-membranes in blennorrhœa neonatorum. Béclard, as early as 1821, described such membranes, and put them in the same category with croup of the respiratory passages. This

escaped the notice of later writers, until Guersant, in 1847, presented the anatomical proof of the connection between the two diseases. What Chassaignac really described were artefacts, brought about by treating the conjunctiva with cold irrigations.

v. MITTELSTÄDT.

PETERS (79) speaks of the finding of virulent diphtheria bacilli in conjunctival affections which do not present the clinical picture of diphtheria, but run the course of a mild croupous conjunctivitis. Probably the xerosis, the pseudo-diphtheria, and the diphtheria bacilli are all members of the same family, differing in virulence.

PETERS (80) here discusses the diplo-bacillus conjunctivitis described by Morax, and later by Axenfeld. He observed 120 cases, and found the micro-organism. The diplo-bacilli do not retain the stain in Gram's method, they have no capsule, and they lie end to end. The affection is, as a rule, binocular. It begins mildly, the lids are gummed together in the morning, and there is some secretion in the sac. Both children and adults are affected.

Although in most cases the diplo-bacillus conjunctivitis runs the course of a chronic blepharo-conjunctivitis, it may, according to AXENFELD (81), begin in a violent manner. Complications and relapses are rare. A ½-per-cent. zinc solution seems to act best.

KUHNT (83), who regards trachoma and follicular conjunctivitis as two distinct affections, recommends for slight cases in immune regions medicamentous treatment only. If the cases are more serious, the mechanical or operative destruction of the granulations should be undertaken. In regions where trachoma is pandemic, recurrences are frequent and operative treatment alone is followed by permanent results.

ELSCHNIG (84) observed, in the left eye of a man of twenty-nine, an infiltration of the bulbar conjunctiva in its entire extent, of yellowish-red color, sharply limited at the corneal margin, over which it projected. The surface of the conjunctiva was smooth, lustrous, and tense, but opaque and not movable over the sclera. After inunction treatment, the infiltration rapidly disappeared.

GARNIER (85) recommends for covering the defect left by the removal of pterygium, the use of the pockets of conjunctiva at the margins of the pterygium. He seizes the pterygium with forceps, pushes in at the corneal margin a spatula or the closed ends of blunt-pointed scissors, and thus separates the growth from

the cornea. A suture is then passed through the upper and lower conjunctival pockets below the pterygium close to the cornea, and the portion of the pterygium to be removed is cut off and the suture knotted. A second suture needs sometimes to be employed, and if the pterygium is so large that its removal would destroy the semilunar fold, it must be displaced toward the caruncle rather than be removed. HIRSCHMANN.

BRENNECKE'S (86) patient was a child of three years, who, during an attack of measles, had a membranous conjunctivitis, which had all the clinical appearances of the diphtheritic form. Examinations, however, repeatedly made, revealed nothing but streptococcus pyogenes. The same were found also in the blood.

BURNETT.

87. SILEX. Nomenclature and terminology of the various forms of keratitis. *Die Heilkunde*, 1897.

88. UHTHOFF and AXENFELD. Further contributions to the bacteriology of keratitis in man. *Graefe's Archiv*, xliv., p. 172.

89. SCHMIDT. The therapeutics of serpent ulcer of the cornea. Bonn, 1897.

90. DUFOUR. Rodent ulcer of the cornea. *Ann. d'ocul.*, cxviii., p. 345.

91. COPPEZ. Corneal changes in conjunctival diphtheria and the local injection of serum. *Ibid.*, p. 347.

92. GRAWEHR. A contribution to the treatment of parenchymatous keratitis. *Inaug. Dissert.*, Basel, 1897.

93. SNELLEN. The treatment of keratoconus. *Graefe's Archiv*, xliv., 1, p. 105.

94. FRIDENBERG, PERCY. A microscopical study of corneal staphyloma. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1897.

SILEX (87) describes keratitis exulcerans myotica, keratomycosis aspergillina (Fuchs), keratitis punctata superficialis, keratitis superficialis (Ransahoff), keratitis maculosa (Reuss), keratitis nummularis (Stellwag), filamentous keratitis, a superficial affection characterized by numerous epithelial defects, striped keratitis, and the corneal opacities appearing after the use of cocaine or sublimate.

According to UHTHOFF and AXENFELD (88), in almost every case of typical serpent ulcer the pneumococcus is found, usually in pure culture.

Of 261 cases of serpent ulcer seen at Bonn, as SCHMIDT (89)

reports, 83 were in women. Twenty-eight were treated with warm moist applications, 2 were cured by cauterization, and in 52 the Saemisch operation was done. Of the 28 treated with warm applications, 20 healed with a macula and 2 with a leucoma adherens. Of the 52 operated cases, 35 were cured, in 4 the ulcer invaded the entire cornea, and in 3 panophthalmitis supervened. Of the 178 cases seen in men, 82 were treated with atropine and warm applications, 10 were cauterized, and 86 were split. The keratotomy brought the ulcer to a standstill in 61 cases.

Under the designation "rodent ulcer," DUFOUR (90) describes a corneal affection spreading from the periphery toward the centre and accompanied neither by secretion nor suppuration. Toward the centre of the cornea the ulcer is limited by an irregular overhanging margin. It is a subepithelial ulcer which does not extend into the depths of the cornea, but spreads laterally, involving the entire cornea in most cases despite every sort of treatment. In two cases cauterizations with a 20-per-cent. alcoholic carbolic-acid solution were of service, but in a third case this treatment was of no avail. The etiology is not clear. SULZER.

COPPEZ (91) shows that the destruction of the cornea in diphtheritic conjunctivitis is caused by the action of toxins. When diphtheria toxin is injected into the cornea of a rabbit, after twenty-four hours the cornea appears opalescent, exactly as the cornea in diphtheritic conjunctivitis appears just before it softens. The cornea then becomes necrotic spontaneously, as the invasion of micro-organisms of suppuration soon leads to suppurative destruction. Subconjunctival injections of some drops of antitoxin are recommended in beginning diphtheritic corneal affections. When a rabbit with a corneal abrasion has diphtheria toxin instilled into the conjunctival sac, the entire cornea becomes necrotic. A subcutaneous injection of antitoxin decreases the reaction and a conjunctival injection prevents it altogether.

SULZER.

In cases of parenchymatous keratitis, GRAWEHR (92) recommends the use of Fowler's solution in addition to the usual treatment.

SNELLEN (93) prescribes a stenopaic glass for his keratoconus patients. Since vision is of wider range when the horizontal slit is broad, and of greater acuteness when the slit is narrow, he has constructed a wedge-shaped slit broad in the periphery and ending in a sharp point at the centre.

FRIDENBERG (94) gives a long and detailed account with illustrations of a case of corneal staphyloma. The distance from the surface of the cornea to the lens was 11.2 *mm.* The distance between the ciliary processes was 12.8 *mm.* The epithelial layer was intact, but enormously thickened and irregular both anteriorly and posteriorly. The iris was adherent to the posterior surface throughout its whole extent, and there was no remnant of Descemet's membrane. It is interesting that the lens still remained in place, and it might be argued from this fact that there had been no perforation of the cornea. Fridenberg thinks, however, that there has been a perforation, but that it closed early, and that the pathological conditions now present developed afterwards.

BURNETT.

Sections XII.–XXI. Reviewed by Prof. SILEX.

XII.—IRIS.

95. VAN DUYSE and VAN SCHEVENSTEEN. Leucosarcoma of the iris. *Arch. d'opht.*, xvii., 4, p. 209.

96. LECHNER. A case of pure acute unilateral cyclitis. *Zehender's klin. Monatsbl.*, xxv., p. 164.

97. RADSWIZKY. A case of complete congenital bilateral aniridia. *Wjest. Ophth.*, 1897, No. 3.

98. PELTESOHN. Two cases of congenital anomaly of the eye: 1. Partial defect of the iris. 2. Bilateral hereditary ectopia lentis. *Centralbl. f. Augenheilk.*, xxi., p. 113.

99. PRICHARD. Intra-ocular myotomy. *Annals of Ophth.*, April, 1897.

VAN DUYSE and VAN SCHEVENSTEEN (95) observed, in the person of a farmer aged fifty-four, a leucosarcoma involving the greater part of the inner half of the iris, extending to the iris angle, touching the cornea, uniformly red, pervaded with vessels, and entirely free from pigment. There were no signs of inflammation, but the tension was increased. The authors discuss the clinical differentiation of this from other forms of tumor of the iris. No pigment was found in the tumor, which proved to be a spindle-celled sarcoma arising from the adventitia of the vessels. The region of Schlemm's canal, a portion of the ciliary body, and the anterior portion of the suprachoroidal space were involved; the lens was atrophic and compressed; and the detached retina had undergone cystic degeneration. Leucosarcoma of the iris is

four times as rare as melanosarcoma. Both lead to metastases less frequently than sarcoma of the choroid, because recognized and removed earlier than the latter. v. MITTELSTÄDT.

LECHNER (96) describes a case, in a man of forty, of numerous precipitations on the posterior surface of the cornea, but with no signs of iritis or choroiditis.

The veteran Bristol (Eng.) ophthalmologist, PRICHARD (99), comes forward to advocate the intra-ocular section of the ciliary muscle for increase of ocular tension. He does it with a small triangular knife, which is entered not far from the corneal edge and pierces the iris at its periphery, going between the edge of the lens and the ciliary body. By a turning movement of the knife the ciliary body is divided. BURNETT.

XIII.—CHOROID.

100. VAN DEN BERGH. A case of chorio-retinitis at the macula due to the light from a Welsbach burner. *Soc. belge d'opht.*, April 24, 1897.

101. STIEL. A contribution to tuberculosis of the eye. *Centralbl. f. Augenheilk.*, vol. xxi., p. 146.

102. POOLEY. Two cases of enucleation in panophthalmitis. *Annals of Ophth.*, April, 1897.

103. CLAIBORNE. A case of metastatic choroiditis following septic septicæmia. *Ibid.*

STIEL'S (101) case shows that tuberculosis of the uveal tract may appear as an irido-choroiditis, an irido-cyclitis, or a serous or plastic chronic choroiditis, without specific symptoms. Tuberculosis of the uveal tract resists all therapeutic efforts.

From a study of the two cases that have recently fallen under his observation, POOLEY (102) concludes that in all cases of panophthalmitis which begin by the invasion of the anterior parts of the eyeball, enucleation is the best and safest, if performed early in the disease. In cases of metastatic origin it should be avoided. BURNETT.

In CLAIBORNE'S (103) case, a primipara of twenty-seven had a normal labor. Three days after, symptoms of septicæmia set in. Two weeks after the appearance of the septic condition the eyes began to be affected, the first appearances being white deposits on the anterior surface of the lenses. This went on to suppurative choroiditis and loss of vision. The patient died.

BURNETT.

XIV.—GLAUCOMA.

104. PERGENS. Buphthalmus with lenticonus posterior. *Arch. f. Augenheilk.*, xxxv., p. 1 [will be translated with plate].

105. ELIASBERG. Some words on M. Bitzor's article "Primary Glaucoma in the East." *Arch. d'opht.*, xvii., No. 5, p. 327.

106. GOLDZIEHER. A case of retinitis pigmentosa with glaucoma. *Centralbl. f. Augenheilk.*, xxi., p. 116.

ELIASBERG (105) protests that the "glaucoma in the East" described by Bitzor is not a peculiar form of the disease, and he warns against Bitzor's suggestion to treat glaucoma by means of sublimate. v. MITTELSTÄDT.

XVI.—LENS.

107. BAQUIS. On the spontaneous intracapsular absorption of cataract. *Ann. di Ottalm.*, xxxvi., 1–2, p. 76.

108. BACH. Histological and clinical reports on fusiform and capsular cataract, with remarks on their genesis. *Graefe's Archiv*, xliii., p. 663.

109. GAYET. On the temporary folding back of the cornea for the purpose of operating *à ciel ouvert* on the iris and the capsule of the lens. *Ann. d'ocul.*, xviii., p. 346.

110. MUTTERMILCH. Notes on cataract operation. *Ann. d'ocul.*, xvii., p. 408.

111. HIDAKA TAKASHI, Tokyo. A contribution to the statistics of cataract operation. *Inaug. Dissert.*, Halle, 1897.

112. DISTLER. Contributions to the operation of senile cataract. *Festschr. d. Stuttgarter Aerztl. Vereins*, 1897.

113. MILBURY. Report of 76 cases of cataract extraction. *Journ. Amer. Med. Assoc.*, April 17, 1897.

BAQUIS (107) treated a man of thirty-eight for episcleritis in an eye which had been blind with cataract for twenty years. Some weeks later the healthy eye was attacked, and articular rheumatism came on. The episcleritis was soon cured, and the rheumatism ran its course in forty days, after which the author discovered, to his astonishment, that the cataract had disappeared, and the patient had $V = \frac{5}{30}$ with $+ 11$. Careful examination showed that this absorption had taken place with intact capsule.

DANTONE.

BACH (108) believes that fusiform cataract may be congenital, or acquired after perforation of the cornea. To the ten cases previously reported he adds two, one in a woman of twenty-one, and the other in a rabbit. In fusiform cataract he supposes that in the development of the lens certain fibres push out through a break in the capsule, and when the capsule finally closes, the fibres in the centre of the lens are altered. The fibres are altered most just behind the capsular cataract, which arises from the proliferation of the capsular epithelium of the lens. In the later development normal fibres are deposited about these altered parts, but the latter remain permanently. SULZER.

In plastic iritis, capsular cataract, and tumor of the iris, GAYET (109), by means of a special fixing forceps, turns back a corneal flap comprising half its extent. In this manner it is possible to keep the region of operation free from blood, and to operate without hindrance. SULZER.

Among MILBURY'S (113) extractions there were sixty-six simple, with one entire loss. Ten were complicated with detachment of the retina, choroiditis, etc. No losses. BURNETT.

XVII.—VITREOUS.

114. AGABABOW. On the etiology of recurrent, spontaneous intra-ocular hemorrhage. *Wjest. Ophth.*, 1897, No. 2.

AGABABOW (114) observed three cases of recurrent intra-ocular hemorrhage in undoubted connection with malaria. The hemorrhage always came on in the stage of chill. In two cases the hemorrhages were in the retina near the veins. With the ordinary anti-malarial treatment the hemorrhages were absorbed. In the third case the hemorrhages were considerable, and led to atrophy of the ball. Examination of the enucleated eye showed detachment of the choroid with atrophy of the choroid and retina.
HIRSCHMANN.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

115. HAITZ. On retinal hemorrhages after glaucoma operations. *Inaug. Dissert.*, Freiburg, 1897.

116. SCHWEIGGER, R. Clinical observations of retinal hemorrhage. *Inaug. Dissert.*, Berlin, 1897.

117. DUNN. A further peculiar case of retinal striations. *Arch. f. Aug.*, xxxiv., 4, p. 294.

118. FÜNFSTÜCK. On the development of retinitis proliferans. *Inaug. Dissert.*, Freiburg, 1897.

119. HÄHNLE. On the duration of life of patients with retinitis albuminurica. *Inaug. Dissert.*, Tübingen, 1897.

120. SALVA. The peripheric visual field in toxic amblyopia. *Ann. d'ocul.*, cxvii., p. 254.

121. DE LAPERSONNE. Horizontal hemianopsia. *Ann. d'ocul.*, cxvii., p. 391.

122. OVIO. Phenomena of ocular fatigue. *Arch. di Ottalm.*, iv., 9–12, p. 277.

123. ANTONELLI. The dissociation of binocular vision in some strabismic and hysterical persons, with a case of monocular hysterical amaurosis. *Arch. d'opht.*, xvii., 4, p. 218.

124. UHTHOFF. Further contributions on the learning to see in children born blind and successfully operated on, and on the forgetting how to see in young children; with psychological remarks on complete congenital amaurosis. *Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xiv., 3–4, 1897.

125. HILBERT. On the seeing of colored spots as a subjective visualization. *Ibid.*, v., p. 381.

126. HUNTER, D. W. A case of detachment of the retina, with peculiar features. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1897.

127. SEABROOK, H. H. Absorption of exudation and hemorrhages in a case of neuro-retinitis with chronic nephritis. *Ibid.*

128. COCKS and WEEKS. A case of retinitis proliferans; enucleation; microscopical examination. *Ibid.*

129. JACKSON. Feigned and hysterical blindness. *Med. and Surg. Rep.*, April 17, 1897.

SCHWEIGGER (116) reports on 450 cases of retinal hemorrhage collected from the histories of 45,000 patients seen by his father in private practice. In an exhaustive and comprehensive way, everything is said which can be said on the subject. Some figures may be noticed. Pure retinal hemorrhage was found in 300 patients, *i.e.*, 6.6 to the thousand; the remainder showing inflammatory symptoms. As regards the well-known white patches, he states that in 300 eyes with hemorrhages, these patches were found 100 times. One fifth of the patients suffered

from diabetes, $\frac{1}{10}$ from albuminuria, and $\frac{1}{20}$ from both affections at once. The number of diabetic patients with hemorrhages, but without retinitis, was three times as large as of those with both hemorrhages and retinitis. In nephritic cases, the number of patients with bilateral albuminuric retinitis was in the ratio of 8 : 1 as regards those with hemorrhagic retinitis. In 10 cases the well-known disc-shaped hemorrhage at the macula was noted. In favorable cases complete resorption took place in from four to six months. Hemorrhagic glaucoma was seen 10 times. The connecting link between the hemorrhages and the glaucoma is the altered state of the vessels in old age. Of 5 cases treated by iridectomy, only one had an unfavorable course. In the concluding chapter the etiology is taken up.

DUNN (117) reports a case of what Knapp has called "angioid streaks in the retina." From the disc more or less sharply contoured striæ lying beneath the vessels extended out to the periphery of the retina. Both eyes were affected. The condition was probably due to retinal hemorrhages. (See the original, with colored plate. These ARCHIVES, July, 1897, p. 387.)

According to FÜNFSTÜCK (118), uncomplicated hemorrhages alone may give rise to the picture of retinitis proliferans, but the development of the affection is facilitated by previously existing decreased resistance of the retina; furthermore, under certain circumstances, the retina itself may give rise to the identical proliferation without hemorrhage.

HÄHNLE (119), in 98 cases of albuminuric retinitis, found that in 82% death occurred within two years after the first appearance; Bull found 73%; Milly, 100%; Trousseau, 62.2%; and Possauer, 69.4%.

SALVA (120) reports two case-histories which show that in the early stages of toxic amblyopia there may be, besides the central scotoma, a peripheric, concentric contraction of the visual field which disappears with the central scotoma. SULZER.

DE LAPERSONNE (121) records the history of a man who, in consequence of a severe injury, sustained a loss of 8–10 sq. *cm* of the bone in the parietal region. In the beginning the patient was completely blind. The vision slowly returned, but only in the upper half of the field. The patient remained under observation for eighteen months without the appearance of any change in the discs. Central vision was $\frac{5}{5}$. No other symptoms of cerebral lesion were present. SULZER.

Ovio (122) made extensive investigations on himself and his assistants in regard to fatigue of the eye, particularly in convergence and accommodation, in direct fixation with different degrees of illumination, in lateral fixation, and in indirect vision in white and colored light. The results of these investigations cannot be presented in an abstract. DANTONE.

ANTONELLI (123), in Landolt's clinic, observed a hysterical boy of thirteen whose left eye, when examined alone, was amaurotic, although pupillary reaction was preserved, but who had, nevertheless, binocular vision. This existed only when the attention was alert, the pictures of Dahlfeld's and Kroll's charts being united in the stereoscope with difficulty, while the test-text was read without hesitation. Similar relations are sometimes found in cases of squint, which may arise from a developmental defect in the sensory sphere of binocular vision. Binocular vision requires not only normal function in the peripheric, but also in the central organs, and perhaps in a certain particular centre also. The patient was not conscious of the unilateral amaurosis, in the same way that hysterical anæsthesia is usually revealed to the patient only by the examination, and in spite of a contracted visual field, the hysterical patient does not lose his power of orientation. v. MITTELSTÄDT.

UHTHOFF (124) reports a new case of congenital cataract in a child of five which was operated on successfully. The case strongly resembles the cases previously reported. Here also it was ascertained that the patient was at first absolutely unable to recognize any person or any object held before it; and this was only learned through the comparative study of previous experiences of the other senses.

The author then reports another case of transient amaurosis after blepharospasm. This is interesting, since the restoration of the vision required a number of weeks, and opportunity for study was thus given. The observations favor Leber's explanation of amaurosis after blepharospasm in young children.

In conclusion he reports a case of total congenital amaurosis from bilateral microphthalmus, which is an important contribution to our knowledge of the psychical life of those born blind.

HILBERT (125) describes a phenomenon observed on himself. With closed eyes he suddenly saw a regular arrangement of star-shaped figures on a dark ground, and after two seconds on a dark-green ground. The spectra lasted a few seconds and van-

ished. One similar case has been reported as seen by a person with healthy eyes.

In the case reported by HUNTER (126), a girl of twelve years had a detachment of the retina of the left eye around the fovea, at which latter place it remained adherent and showed a brilliant cherry-red spot, as it appears in embolism of the central artery of the retina. In the course of four months the retina ruptured around the adhesion, leaving the red spot still visible.

BURNETT.

SEABROOK (127) has seen a number of cases—10 in all—where the exudation and hemorrhages accompanying nephritis, diabetes, and other general disorders, became absorbed and useful vision restored. In none of these was there a history of syphilis.

BURNETT.

The clinical history of the case is given by COCKS (128). The histological examination was made by WEEKS. The principal interest in the case attaches to the latter. It was found that the new-formed membranes were organized clots. The causes of the films appear to be as follows: Partial obstruction of the arterial circulation by arterial fibrosis; a sluggish venous current, with a fibrous degeneration of the venous walls, causing their distention; and perhaps new-formed venules. Transudation of fibrin-forming elements takes place into the vitreous, and some hemorrhage may also occur at these points. Formative cells are projected into the layer of fibrin or blood-clot, producing thin-walled blood-vessels and fibrous tissue. Hemorrhages may occur from these newly-formed blood-vessels. The cause of the fibrous degeneration in the walls of the blood-vessels of children (the case was a boy of eight years) is not known.

Among other tests for simulated blindness, JACKSON (129) suggests the employment of a prism of six or eight degrees placed with its base towards the temple. If there is vision, that eye will instinctively turn in, in order to avoid double images.

BURNETT.

XIX.—OPTIC NERVE.

130. KALT. Endothelial sarcoma of the optic nerve. *Soc. d'opht.*, March 9, 1897.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

131. DAHLFELD. The discovery of foreign bodies in the eye by means of the X-rays. *Deutsche med. Wochenschr.*, No. 18, 1897.

132. RAULIN. Foreign bodies in the eye. *Ann. d'ocul.*, cxviii., p. 287.

133. HIRSCHBERG. On the removal of splinters of copper from the eye. *Berliner klin. Wochenschr.*, No. 15, 1897.

134. INOUYE. On a case of ocular injury from a blunt force, and particularly on detachment of the capsule of the lens. *Centralbl. f. prakt. Augenheilk.*, xxi., p. 147.

135. VARESE. Echinococcus cysts of the orbit, with papillitis. *Arch. di Ottalm.*, ix., 7, 8, p. 266.

136. FRIDENBERG. The localization of foreign bodies in the eye with the aid of the X-rays. *Med. Record*, May 15, 1897.

DAHLFELD'S (131) experiments show that it is possible to discover the presence of foreign bodies in the eye by means of the X-rays; but that a negative result does not prove the absence of a foreign body, for this may lie in such a position as to be masked by the shadow of the orbital margin, and may be revealed only by placing the apparatus in a different position.

RAULIN (132) reports the case of a man whose right eye was perforated by a chip of copper, which had been retained without inconvenience for twenty years. After this time the chip of copper was extruded through the cornea spontaneously.

SULZER.

HIRSCHBERG (133) states that foreign bodies of copper, even though aseptic, cause by their chemical disintegration suppuration, detachment of the retina, etc., much more readily than aseptic particles of iron, which may remain in the eye and cause no reaction. He adds two new observations to his sixteen previous ones. In one case, the splinter of copper was removed with forceps through a scleral section; in the other, after iridectomy, by passing forceps through the lens and grasping the body which lay just behind it. The lens will be removed later. HERRNHEISER.

VARESE (135) describes an echinococcus tumor of the orbit causing exophthalmus, diminution of mobility, and choked disc. The cyst was punctured and the signs of irritation decreased. Seven months later a cyst as large as a pigeon's egg was extirpated. The recovery was permanent. DANTONE.

FRIDENBERG'S (136) method of skiagraphy consists in getting two exposures of the eye and orbit at right angles to each other.

XXI.—OCULAR AFFECTIONS IN GENERAL DISEASES.

137. De Lapersonne. Meningitis due to pneumococci after enucleation and orbital operations. *Soc. franç. d'opht. Ann. d'ocul.*, cxvii., p. 351.

138. Ferri. Endogenous infection of the eye with the pneumococcus. *Ann. di Ottalm.*, xxvi., 3, p. 306.

139. Basso. An epidemic of hemeralopia with xerosis of the conjunctiva. *Ann. di Ottalm.*, xxvi., 3, p. 275.

140. Spanbock and Steinhaus. On the simultaneous existence of bitemporal hemianopsia and diabetes insipidus. *Centralb. f. Neurologie*, No. 11, p. 491, 1897.

141. Ziehl and Roth. A case of brain tumor cured by operation. *Deutsche med. Wochenschr.*, p. 297, 1897.

142. Alfieri. Metastatic choroiditis; exenteration of the ball, death from pyæmia, autopsy and examination of the stump. *Ann. di Ottalm.*, ix., 9–10, p. 328.

143. Heinersdorf. Bilateral central amaurosis in consequence of metastatic abscesses in both occipital lobes, without other brain symptoms. *Deutsche med. Wochenschr.*, No. 15, 1897.

144. Dor. Extract of the ciliary body of the ox in ophthalmic therapy. *Ann. d'ocul.*, cxvii.

145. Vossius. On the ocular affections caused by caterpillar hairs. *Beiträge zur pract. Augenheilk.*, No. 13, 1897.

146. Lübbers. A contribution to the knowledge of the eye changes appearing in patients with disseminate sclerosis. *Arch. f. Psychiat. u. Nervenkrankheiten*, xxix., 5, p. 768.

De Lapersonne (137) enucleated the eye of a child for purulent traumatic irido-cyclitis. In spite of antiseptic precautions and without any signs of wound injection the patient died of meningitis ten days later. The autopsy showed that the thick purulent exudation at the base of the brain contained a pure culture of the pneumococcus, and that this had made its way into the interior of the skull through the lymph passages of the optic nerve. De Lapersonne calls attention to the fact that bichloride has no effect on the pneumococcus because it does not penetrate the capsule. This latter is dissolved by alkalies and these hinder the development of the pneumococcus. Hypochlorite of lime in $\frac{1}{10}$ solution is the best disinfectant, and it is well borne by the conjunctiva.

Sulzer.

FERRI (138) observed a purulent choroiditis, coming on four days after a croupous pneumonia, and causing a perforation of the globe. The pus contained the Fraenkel diplococcus, which had passed into the choroid by metastasis. The other eye, at the same time, presented symptoms of glaucoma which passed off after an injection of bichloride solution beneath Tenon's capsule. The author discusses the question whether this affection of the other eye was caused by the diplococcus or its toxins. DANTONE.

BASSO (139) observed, in a boys' asylum in Genoa, an epidemic of idiopathic hemeralopia with xerosis of the conjunctiva affecting 30 per cent. of the inmates. They were all carefully examined and the results are compared with those of others who have written on the subject.

SPANBOCK and STEINHAUS (140) are of the opinion that the bitemporal hemianopsia sometimes observed with diabetes is not due to the same focal disease as the diabetes. The bitemporal hemianopsia arises from an affection of the chiasm; the diabetes from a lesion in the floor of the fourth ventricle. The conjunction of the two affections is, the authors believe, accidental. They report a case of this sort.

In ZIEHL and ROTH'S (141) case a brain tumor in a man of sixty was completely removed only by a second operation three months after the first. Two years later the patient was in good health and the eyes were not affected.

ALFIERI'S (142) patient had a purulent choroiditis that was regarded as metastatic, although no primary focus could be found. Exenteration of the eye was done on account of pain. Ten days later the patient died of septicæmia. At the autopsy an endocarditis was found with ulceration of the tricuspid gland, purulent deposits on the pia mater, and small abscesses in the cortex of the kidneys. A description of the stump of the eye on which exenteration had been done is given also. DANTONE.

HEINERSDORF (143) relates the history of a patient who became blind within two weeks. Shortly before, he was treated for a lung affection from which he was speedily recovering, until one day febrile symptoms came on, his general condition grew worse, and a painful swelling appeared on the ulnar side of the forearm. These symptoms decreased, but vision began to fail. Somewhat later, an abscess developed in the groin, and vision was reduced to $\frac{1}{60}$. There were headache and somnolence, but no disturbances of motility or sensibility. The patient died, and a large abscess

was found which had apparently started in the medullary substance of the occipital lobe. In cases of this sort there are generally more symptoms of brain lesion.

Loüis Dor (144) reports the case of a man whose right eye had been enucleated and whose left was nearly blind from a sympathetic iridocyclitis. Instillations of ciliary-body extract from the ox were employed and aqueous humor of the ox injected into the anterior chamber, with considerable improvement in vision.

Vossius (145) discusses ophthalmia nodosa (Saemisch), which was first described by Pagenstecher, and reports a case of his own in which the usual caterpillar hairs were found.

Lübbers (146) reports on eleven cases of multiple sclerosis. In nine there were ophthalmoscopic changes in the disc (atrophy and neuritis). In seven there was a central scotoma and normal peripheric field; in one a scotoma with contraction of the field; in two irregular peripheric contraction; and in one case the field was normal. In seven cases ocular muscles were affected. All the patients had nystagmus.

MISCELLANEOUS NOTES.

CORRECTION BY DR. GEORGE T. STEVENS.

To the Editor of THE ARCHIVES OF OPHTHALMOLOGY :

DEAR DOCTOR: On opening to-day an old number of Tiemann's *Reprints* my attention was at once drawn to an illustration of a form of cranial calipers so similar in principle to that which accompanies my article in your July number (Fig. 8, p. 367) that it is practically the same instrument. I had not seen the journal in which the instrument was originally described, and I knew of no such instrument when my article was written. Of course I had no intention of appropriating the device of another, and I take the earliest opportunity to credit the priority of the instrument to Dr. Frederick Peterson, who described it in the *American Journal of Insanity*, July, 1895. Truly yours,

GEORGE T. STEVENS.

December 15, 1897.

DEATHS, RESIGNATIONS, APPOINTMENTS, AND ANNOUNCEMENTS.

Dr. EDWARD L. HOLMES has resigned the Professorship of Ophthalmology and Otology in the Rush Medical College of Chicago, which he has held since 1860. He will be succeeded by Dr. HARPER of the Chicago University, with which the Rush Medical College will be united. Dr. Holmes will be seventy years of age on February 11, 1898. He was the founder of the Illinois Eye and Ear Infirmary, one of the few State institutions of its kind in America. His valuable contributions to the science and practice of ophthalmology are well known. His genuine kindness and sterling character are highly appreciated by all who have had the privilege of being acquainted with him.

Prof. N. ANAGNOSTAKIS of Athens, Greece, died in his seventy-second year.

F. HOLMGREN, Professor of Physiology at the University of Upsala, known to ophthalmologists all the world over particularly by his excellent and practical researches on color-blindness, died in September, 1897, 66 years old.

Dr. RUDLOPH BERLIN, since 1890 successor of ZEHENDER in the Professorship of Ophthalmology at the University of Rostock, Mecklenberg, died September 12, 1897. Among his numerous valuable publications, the most appreciated is the excellent monograph on the diseases of the orbit in Graefe-Saemisch's *Handbuch der Augenheilkunde*. His successor is Dr. THEO. AXENFELD, former assistant of Prof. Uhthoff of Breslau.

Prof. MAX BURCHARDT, M.D., since 1880 Executive Surgeon of the ophthalmic department of Charity Hospital in Berlin, died September 26, 1897. Privat-Docent Dr. R. GREEFF has been appointed his successor.

Dr. L. ALEXANDER of Aix-la-Chapelle, Germany, died October 17, 1897. His monograph, *Syphilis und das Auge*, has had a wide circulation.

Dr. CHARLES B. MEDING of this city has been elected Executive Surgeon of the Harlem Eye, Ear, and Throat Infirmary, in place of Dr. R. E. SWINBURNE, deceased.

In Washington, D. C., the EPISCOPAL EYE, EAR, AND THROAT HOSPITAL, for the treatment of dispensary patients, was opened last year.

We regret being obliged to lay a number of BOOK NOTICES over to our next issue.

Contents of the last numbers of the Archiv für Augenheilkunde (German Edition of these ARCHIVES).

Vol. XXXV., Nos. 2 and 3. Issued Sept., 1897. (With 13 plates and 2 text figures.)

8. E. AMMAN. Case of retinitis circinata with autopsy (will appear in our March number).

9. H. SCHLUB. Fibromatous formation at the limbus corneæ in spring catarrh.

10. R. GREEFF. On twin-ganglion cells of the retina.

11. G. L. JOHNSON. Anatomy of the mac. lut. (translated from the Eng. Edition).

12. E. LUBOWSKI. On tuberculosis of the eye.

13. A. HOCHE. Pathogenesis of choked disc.

14. PH. STEFFAN. Experiences and studies on strabismus.

15. M. GOERLITZ. Anatomy of the so-called coloboma of the optic nerve.

16–17–18. Controversial.

Systematic Report of 1st quarter of 1897 (published in No. 4, Eng. Ed., 1897).

Vol. XXXV., No. 4. Issued Nov., 1897.

19. C. FRÖHLICH. Surgical treatment of excessive myopia.
20. G. ISCHREYT. Cysts of Krause's glands.
21. K. RUMSCHEWITSCH. Cysts in bulbar conjunctiva.
22. F. OSTWALT. Means to combat infection in intra-ocular operations.
23. A. GLOOR. Abnormal tortuousness of retinal veins of both eyes.
24. Controversial.
25. Report on the transactions of the Heidelberg Ophthalmological Society (will appear in our March number).
26. Report on the ophthalmic section at the Moscow International Medical Congress, by NIEDEN (published in the present number).

Vol. XXXVI., Nos. 1 and 2. Issued Dec., 1897. (With 6 plates and 22 text figures.)

1. C. SCHWEIGGER. Downward simple flap extraction.
2. ALFRED GRÄFE. The vision in strabismus.
3. W. MANZ. Case of bilateral homonymous hemianopsia.
4. ULRICH. Nutrition of the cornea.
5. K. KASTALSKY. Case of bilateral coloboma of the yellow spot.
6. V. FUKALA. Function of Brücke's muscle.
7. W. HÜBNER. Pinguecula.
8. R. A. REDDINGIUS. Strabismus.
9. J. WEILL. Bacillar tuberculosis of iris and ciliary body.
10. K. DALLWIG. Torticollis in vertical deviation of one eye.
11. E. ADAMÜK. Traumatic degeneration of the retina.
12. A. STEIGGER. Etiology and variability of corneal astigmatism.
13. K. RUMSCHEWITSCH. Case of papilloma of the conjunctiva.
14. BECHE. Remarks on measurement of visual acuteness.
15. S. BACH. Histology and pathogenesis of posterior lenticonus (will be translated soon).
16. C. HORSTMANN. Course of spontaneous detachment of the retina.

Systematic Report of 2d quarter of 1897 (translation in the present number).

edies, and instruments, and to discuss in a progressive, yet conservative spirit all questions of present importance.

The ARCHIVES contain exclusively original papers on all branches of Ophthalmic and Aural Surgery, and original reports on the progress of Ophthalmology and Otology throughout the world. The original papers occupy about three-fourths of the space, and their scope embraces all subjects of scientific and practical interest in the departments of Ophthalmology and Otology.

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NEW YORK
27 & 29 WEST 23D STREET.

LONDON
24 BEDFORD ST., STRAND.

PUBLISHER OF THE GERMAN EDITION
I. F. BERGMANN
20 Schwalbacher Strasse, Wiesbaden.

EDITORIAL NOTE.

In asking for continued support of the ARCHIVES from subscribers and contributors, the Editors offer no new program, but point to the record of the work that has been accomplished during the past twenty-eight years. At the first appearance of the ARCHIVES in 1869, they constituted the only periodical of their class in America, and had only a few predecessors in Europe. The international character of the ARCHIVES was a novel and distinctive feature.

The original program of the ARCHIVES to publish only original papers in semi-annual independent numbers has, in the course of years, been extended by the addition of reviews of the current ophthalmological and otological literature.

With the eighth volume, in 1879, the combined ARCHIVES, issued semi-annually, were divided into two separate journals, issued quarterly, and each of about the same size as the combined journal, and the reviews were converted into quarterly reports, systematic and comprehensive, though concise, on the progress of ophthalmology and otology.

Since that date, the ARCHIVES have developed into an extensive and conveniently arranged storehouse of knowledge for the instruction of the student and for reference by the practitioner and the investigator.

For more than ten years, the valuable material offered to the ARCHIVES has been so abundant that it has not been practicable to utilize for the English edition the full series of papers from the German, or the converse. Many articles had to be abridged, while of others abstracts only could be printed. Any one of our readers could, however, have secured, and can secure in future, from the American editor, or the German publisher, the loan of the original papers presenting the complete text.

It is the purpose of the editors to arrange, in the department of Reports, for the review of every publication which in their opinion contains material that can be called distinctive and important. It is, of course, impossible, within the limits of the ARCHIVES or of any similar journal, to give attention to every publication in their department of science. We may state further that it is not a part of our program to furnish a complete report on the *bibliography*, but only on the **progress** of ophthalmology and otology.

Though the systematic arrangement of the reviews is of importance for reference and comprehensive information, we shall publish, as early after the meetings as practicable, reports of the proceedings of societies, always bearing in mind that the ARCHIVES are not intended to be only a repertory of knowledge, but also a journal of news.

It is natural that the English edition of the ARCHIVES should give the advantage of time and space to Anglo-American contributors over the German, and *vice versa*. It is evident, however, that the association of the two editions lends strength to each, furnishing to the authors a wider circulation for their papers, and to the readers a larger and more diversified field of information.

ARCHIVES OF OPHTHALMOLOGY

NOTICE TO OUR READERS.

The ARCHIVES OF OPHTHALMOLOGY contain *original papers* on all branches of ophthalmic surgery, and *original reports* on the progress of ophthalmology. The original papers occupy from two thirds to three fourths of the space, and their scope embraces all subjects of scientific and practical interest connected with this department of medicine.

The object of the ARCHIVES is to guard, solidify, extend, and diffuse the stock of acquired ophthalmic knowledge by recording the constant addition of new observations, investigations, methods and means of examination, clinical experience, instruments and remedies, and further by taking part in the discussion of the questions of the day with a spirit alike conservative and progressive.

Particular attention is paid to the preparation of the Report on the Progress of Ophthalmology. The report is intended to furnish a *complete, systematic, and early* review of the current ophthalmological literature of the world. It has been necessary to divide the work of its preparation among a number of collaborators according to the following arrangement:

Dr. ST. BERNHEIMER, of Vienna.

1. *General Ophthalmological Literature:*
   a.—Text-books (not abstracts, but notes pointing out what is new and characteristic).
   b.—Monographs and papers on historical, statistical, and general subjects; reports on societies and hospitals.
   c.—Periodicals on our specialty (short notices of their character, time and place of publication, the titles of the original papers, with the names of their authors).

2. *General Pathology, Diagnosis, and Therapeutics*, including new instruments, apparatus, and remedies.

3. *Normal Anatomy and Physiology*, including color-blindness.

Dr. C. HORSTMANN, Prof. at the University of Berlin (Potsdamer Strasse 4):

1. *Anomalies of Refraction and Accommodation.*
2. *Eyelids.*
3. *Lachrymal Apparatus.*
4. *Muscles and Nerves.*
5. *Orbit and Adjacent Cavities.*
6. *Conjunctiva, Cornea, Sclerotic.*
7. *Injuries and Foreign Bodies of these parts.*

Dr. P. SILEX, Lecturer at the University of Berlin.

1. *Uveal Tract*, including glaucoma.
2. *Refracting Media*, including the lens.
3. *Retina and Optic Nerve.*
4. *Injuries and Foreign Bodies of these parts.*
5. *Ocular affections in connection with general diseases.*

In order to obtain complete and recent reviews on the non-German ophthalmological literature, special reporters have been selected for different countries, who will send monthly abstracts of all local ophthalmological publications to Dr. C. Horstmann, of Berlin, the editor of the Report. Dr. Horstmann will distribute these abstracts among the German reporters according to the above plan, in order to preserve the systematic arrangement which we think of paramount importance.

The special reporters are:

For America: Dr. SWAN M. BURNETT, 916 Farragut Square, Washington, D. C.

For Great Britain and Ireland: Dr. L. WERNER, 31 Merrion Square North, Dublin.

For France and Belgium: Drs. D. E. SULZER, 22 Rue de Tocqueville, Paris, and P. VON MITTLESTÄDT, Metz.

For Germany: Drs. BERNHEIMER, Vienna, HORSTMANN, SILEX, and DEUS, in Berlin.

For Italy: Dr. DANTONE, Rome.

For Russia: Prof. HIRSCHMANN, Charkow.

For Scandinavia: Drs. OLE BULL and SCHIÖTZ, Christiania.

For Holland: Dr. C. A. H. WESTHOFF, of Amsterdam.

In the interest of our readers, who are scattered over the whole world—and whom, like ourselves, we desire to keep informed of all advances in ophthalmology,—furthermore in their own interest, authors of ophthalmological works are requested to send reprints, duplicates of journals, or copies for reviewing, to one of the above-named reporters, or to the editors or publishers of the Archives, according to their convenience.

The abstracts of American ophthalmological literature formerly appeared under a special head, but are now embodied in the systematic Report. Text-books may be specially noticed.

The number of good papers offered us for publication has increased to such an extent that it is no longer possible to translate all of them unabridged. Whenever a German paper is condensed in the English version, or *vice versa*, it will be so stated. Should any one of our readers wish to recur to the original, the editors will always take pleasure in sending it for reference.

Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the ARCHIVES, and are solicited.

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